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PARIS UNIVERSAL EXPOSITION, 1867.

REPORTS OF THE UNITED STATES COMMISSIONERS.

REPORT

UPON THE

PRECIOUS METALS:

BEING

STATISTICAL NOTICES

OF THE

PRINCIPAL GOLD AND SILVER PRODUCING REGIONS OF THE WORLD
REPRESENTED AT THE PARIS UNIVERSAL EXPOSITION.

BY

WILLIAM P. BLAKE,

COMMISSIONER FROM THE STATE OF CALIFORNIA.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1869.

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REPORT ON THE PRECIOUS METALS.

INTRODUCTION.

This report was prepared at the request of Committee No. 6 of the United States Commission, and was submitted in December, 1867.

The short time allowed for the work (from September to December) did not permit of an attempt to describe and discuss the various methods of extracting these metals from their ores, and as most of the principal gold and silver producing regions of the globe were represented at the Exposition by specimens, maps, and statistics, with the object of presenting a view of the nature and the extent of the resources of each country in the precious metals, it appeared proper that the report should compass, as far as possible, the object of the various exhibits. Accordingly, brief descriptive and statistical notices of most of the known gold and silver producing regions of the world have been given, with the addition, in some cases, of notices of regions not represented at the Exposition, in order to make the report more complete, and to give as nearly as possible the statistics of the annual production of gold and silver.

Statistics of the production in Europe and other countries were obtained as far as possible up to the year 1867; but the delay in printing the report of the United States commissioners has enabled the author to present some later returns, especially from the United States, and to make some additions to the report, including a chapter upon international coinage.

If this delay in the publication of the report had been foreseen, the plan of the work would have been somewhat different, and arrangements would have been made to obtain publications and statistics, especially from South America, Russia, and Europe, so as to state the amount of production down to the year 1868, or later.

The returns so far received from the Pacific coast indicate that there has been a very considerable falling off in the production for the year 1868, not only in gold but in the silver of Nevada. It also appears probable that the statement of the total gold and silver production of the country for 1867, given on page 212, although considerably less than other published estimates, is yet too high by from $2,000,000 to $2,500,000, or about the amount which is credited, by estimate, to Utah and unenumerated sources. The total value of the yield for 1867 was probably from $69,000,000 to $70,000,000, and for 1868 from $65,000,000 to $66,000,000.

It is impossible, in a work of this kind—the greater part of which was printed in 1868—to present statistics as late and fresh as those given from time to time by the enterprising journalists of California, who make

the collection of accurate statistics and late information from the mining districts a specialty. The progress of discovery in our unexplored mineral regions is so rapid that new and important information is almost daily received.

The author is specially indebted to "Carmany's Commercial Herald and Market Review," and to the quarterly reports in the "Alta California," for statistics of the production in the Pacific States and Territories, and he also acknowledges his obligations to several of the foreign commissioners and others at the Exposition for valuable statistical information.

Respectfully submitted:

WILLIAM P. BLAKE.

JANUARY, 1869.

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GOLD.

CHAPTER I.

THE GOLD REGIONS OF NORTH AMERICA, WITH STATISTICS OF THE PRODUCTION OF GOLD.

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CALIFORNIA.

The gold of California was represented in the Exhibition by a systematic collection of the ores from the principal mines, made chiefly by the Commissioner of the State, and by a second, and, in some respects, similar collection contributed by the miners and mining companies of California to Dr. Pigné for the Imperial School of Mines of France. The number of specimens of gold and its ores in the two collections was about 500, and they included not only gold-bearing quartz but specimens of placer gravel and cement, and of the miscellaneous ores and minerals of the Pacific coast.

EXTENT OF THE CALIFORNIA GOLD FIELD.

The principal gold region of California is upon the western slope of the mountain chain of the Sierra Nevada, and is nearly co-incident with it in extent. Commencing at the south in Tulare and Kern counties, nearly under the parallel of 35°, it extends northwards through the whole range of counties of the State to the Oregon line—the parallel of 42°—thus extending over seven degrees of latitude, or about 500 miles.

The great bulk of the gold is, however, obtained from the central counties: Mariposa, Tuolumne, Calaveras, Amador, El Dorado, Placer, Nevada, Sierra, Yuba, Butte, and Plumas, lying between the parallels of 37° and 40°. This is the region of the most extensive and productive placers. Gold is also found upon the coast in Del Norte county, and at several places in the Coast mountains southward.

At San Francisquito in Santa Barbara county, south of the main gold field, placer gold was discovered as early as 1838, and gold was known

to exist along the Colorado river as early as 1775. Gold is not confined to the western water-shed of the Sierra, for it is found at many places on the eastern side as well as near the summit. Alabama district, in the great valley of Owens lake, east of the crest of the mountains, is noted for the richness in gold of its narrow veins. At Armagosa, in the Great Basin, gold was mined several years ago, and veins in Holcomb valley, north of San Bernardino, have been extensively prospected within the past five years. The working of deposits of placer gold further north and on the east slope of the mountains, along and near the valley of Carson river, led to the discovery of the great Comstock lode, which has given so many millions of silver to the world.

GEOLOGY AND THE GOLD-BEARING VEINS.

The principal rocks of the gold belt on the west slope are clay-slates, sandstones, and conglomerates of the Secondary period uplifted at high angles and dipping east. They are generally much altered—metamorphosed—and are associated with serpentine; also a metamorphic rock. Gold-bearing veins occur in or are closely associated with all of these rocks, and in hard and compact granite, in greenstone and dioritic rocks, and in dolomite and metamorphic limestones. They are found even in the partially metamorphosed stratified formations of the Cretaceous period in the Coast mountains, and they may also be found in the Tertiary strata.

It was formerly the generally accepted opinion that productive gold veins were confined chiefly to the metamorphosed older Palæozoic formations—the Silurian rocks. The gold-bearing rocks in the Ural mountains and in Australia have been shown to be Palæozoic, belonging in Australia to the lower Silurian division.

The discovery of fossils of the Carboniferous period in California by Dr. Trask in 1854, the exploration of the gold region by the writer in 1853–'54, and the subsequent discovery of Secondary fossils in the main belt of gold-bearing slates, together with the discoveries in Hungary in 1861–'62, proving that the rocks holding the gold belong to the latest geological periods, even as late as the Tertiary, all show the fallacy of the opinion that productive gold veins are associated chiefly with the older rocks.

The gold-bearing veins of California are largest and most extensive in the region of the metamorphosed Secondary rocks. They generally conform to the dip and strike of the strata, and vary in width from a few inches to 20 or 30 feet. When they traverse granite or metamorphic rocks, in which the stratification is nearly or quite obliterated, they are generally narrower and more uniform in width than when in the softer rocks or slates. The most extensive vein of the State, and perhaps in the world, is known among the miners as the "Mother vein," and extends, but with some considerable breaks and interruptions, from Mariposa northwestward for 80 or 100 miles, following a zone or belt of

Jurassic slates and sandstones, and closely associated with a stratum of dolomite or magnesian rock, often a magnesite, filled with reticulations of quartz veins, and charged with pyrites. The outcrops of this rock are generally very rusty and porous in consequence of the decomposition of the pyrites, and show green films of an earthy mineral containing chromium.

Nearly all of the auriferous veins of California are composed of white, or bluish-white quartz, with, in general, not over two per cent. of sulphurets. These sulphurets are chiefly ordinary iron pyrites, with, occasionally, a little galena and blende. In some veins iron pyrites is replaced by arsenical pyrites or mispickel, as, for example, in the mines of the Clear Creek district in Tulare county. An example of a vein containing much more than the usual amount of sulphurets is found in the Soulsby, near Sonora, Tuolumne county, (specimens Nos. 110 and 111 of the California collection.) In these the sulphurets form more than half of the bulk of the ore.

The collection contained not only the white and bluish-quartz specimens taken from below the water-level in the veins, and showing the bright glancing pyrites, but exhibited, also, the appearance of the ore from the upper portion of veins above the permanent water-level, and near the outcrops, where, under the influence of air and moisture, the ore decays and becomes browned and rusted by the decomposition of the pyrites. By this natural decomposition the gold contained in the pyrites is liberated and left in a condition to be readily separated from the ore by mechanical means. Such ores are, of course, more readily and cheaply worked than those in which the sulphurets are not decomposed, and they give a better yield in ordinary working. The collection contained, also, a series of the concentrated sulphurets as obtained by washing from various mines, some of which were very rich in gold, and are worked at the localities by the chlorination process of Professor Plattner.

Most of the specimens exhibited were hard and flinty, and the veins from which they were taken are in hard rocks, requiring the use of powder for extracting or mining the ore, and powerful machines to break it up to a size suitable to be placed under stamps. Some of the ores, however, are remarkable for their softness and friability, being soft enough to be crushed in the hands, and to be excavated from the veins by a pick alone. Several specimens from the Sierra Buttes mine, and others from the Jefferson, at Brown's valley, were merely granular powders, looking like powdered salt or sugar.

The whole collection from California contrasted very strongly in appearance with the collection from Colorado Territory, arranged opposite it, which was characterized by the abundance of massive sulphurets of iron and copper, to the almost entire exclusion of quartz. The white flinty quartz of California, with its hidden particles of free gold, could not be said to have a metallic appearance; while the ores from Colorado

had the semblance of extreme metallic richness, and many no doubt mistook the glittering pyrites for the noble metal.

The average fineness of California gold was formerly about .885. For a few years past it has not averaged so high, ranging from .865 to .870, and containing about one per cent. of the base metals; its composition being, nearly, .87 gold, .12 silver, and .01 base metals. This decrease of fineness is due, undoubtedly, to the increased quantity of gold from veins, and, perhaps, to the mingling of gold from Idaho, which contains a large amount of silver.

Following are brief notices of some of the principal mines of California represented by specimens in the Exposition. The notices follow in the order of succession of the mines from the southern end of the gold region northward.

TULARE COUNTY.

Long Tom mine.—This claim, situated on Posa Flat, about 25 miles west of Havilah, is one of the most prominent and successful mines in the southern part of the gold region. The vein is nearly vertical, from three to eight feet wide, and cuts through granite. The quartz is impregnated with arsenical pyrites, (mispickel,) and it has been rich in gold from the surface to a depth of 200 feet, or as far as the shaft has been sunk. The general characters of the ore, and of the sulphurets, are well shown by the suite of specimens in the collection, Nos. 87 to 90, some of which are from below water-level, and others from above.

A mill of ten stamps was erected a short distance below this mine, and it has been in constant and successful operation. The receipts of bullion in the month of October, 1866, were $16,500; in November, $17,500, and in December about $20,000. The entire expenses of the mine and mill were said to be less than $3,000 a month.

Joe Walker mine—Walker's Basin, southeast of Havilah. This vein was accidentally discovered by a farmer when out looking for stock. It was sold in June, 1866, for $2,000, and by December was opened by a shaft to a depth of 200 feet.

A 20-stamp mill was completed in October, and gave an average daily yield of about $1,200 from about 30 tons of ore. The vein is from three to eight feet in width, and the quartz is quite friable and easily crushed.

Mammoth lode—On Kern river, a few miles northwest of Havilah. This is a very large and well-defined vein, extending for a great distance over a high ridge, in a position which permits it to be worked by tunnels. A new mill was erected upon the river last year, and preparations were making to work the vein upon a large scale. This vein is reputed to have yielded about $1,000,000 in all, prior to the great floods of 1861-'62, which swept away the mills, and put an end to the mining operations.

Clear Creek mines.—There are several interesting and important mines in the immediate vicinity of Havilah, some of which—the *Rochefort* and the *French Friend*—were represented in the collection. The ores of the

district are all characterized by a great abundance of arsenical pyrites, and are generally quite rich.

MARIPOSA COUNTY.

There are not many important mines yet known northward from the Clear creek and Kern river region until Mariposa county is reached, and none are represented in the collection.

Mariposa vein.—This is one of the principal veins on the Mariposa estate, and is noted for the rich bunches or pockets of gold which have been found in it from time to time, some of which have yielded from $30,000 to $75,000; but mining this vein, on the whole, has not been successful.

Princeton vein.—This is also on the Mariposa grant, and is one of the most celebrated in California. It traverses clay-slates nearly parallel with the bedding, but gives evidences of having been formed in a fissure or plane of dislocation of the strata. It is from two to seven feet wide where worked, but the average is not over three feet. There are five or six shafts, the deepest of which is between 600 and 700 feet, and the principal level is over 1,200 feet long. This vein has yielded an aggregate of about $3,000,000, but it is not now worked. The ore has averaged about $16 per ton, and has given large profits.

The vein is composed of hard white quartz, and is divided into parallel layers or plates by thin slaty films, which are generally charged with fine-grained pyrites and free gold, forming what is known among the miners of California as "ribbon-quartz." The more solid and compact masses of quartz often contain iron pyrites in brilliant crystals. Galena occurs also, but not in large quantities. Gold in irregular, ragged masses, and sometimes in crystals, occurs with these minerals. It appears to be most abundant in contact with the galena, and when much galena is seen in the quartz a large yield is expected. Gold is frequently found spreading in films over the surface of crystals of iron pyrites, or extending through the crystals in thin sheets. It occurs also entirely isolated from either the pyrites or galena, and in the midst of solid white quartz. The specimens of crystallized gold broken out of this vein were bunches of octahedrons, with perfectly flat and highly polished faces from one-eighth to three-sixteenths of an inch across, and were attached to masses of white quartz.

Pine Tree and Josephine.—These veins, also on the Mariposa estate, are on the south bank of the Merced river, and intersect so as to form in reality one large vein, which is a portion of the great Mother lode. This lode extends northwestward from this point for 70 or 80 miles, broken, however, and disappearing at intervals, yet always presenting the same general characteristics, and affording similar ores. The position of the Pine Tree and Josephine veins is such, on the high bank of the river, that they are worked and drained through tunnels, and the quartz is taken by a tramway to the bank of the river to be crushed in mills driven by

water-power. The mine is extensive, and very large quantities of quartz have been extracted and worked, but there are no complete and reliable statistics of the yield. The quartz has averaged from $8 to $9 per ton as worked, but it is possible to select the ore so that the yield would be much higher. It is reported that the yield of this ore has been much increased during the past year by an improved system of working. The ore is first dry-crushed, and then triturated to a fine powder in what is known as a Lumsden's crusher. This consists of a revolving iron cylinder, in which the dry powder is placed, together with a great number of hard cast-iron bullets. After revolving long enough to secure the desired fineness of the powder, the amalgamation is effected by Ryerson's process. This consists in exposing the powder to the hot vapor of quicksilver in a closed vessel. This vapor is subsequently condensed by a jet of cold water, and the amalgamated gold is separated from the pulp by washing in the usual manner. It is claimed that, by this process of working, the yield is nearly double what can be obtained by the ordinary method of wet-crushing and battery amalgamation.

Coulterville and Hites's Cove.—Between the Pine Tree mine and the town of Coulterville there are several other mines and outcrops of importance along the course of the Mother lode. Among these the Emily, the Adelaide, and the Crown lodes may be mentioned. There are also important mines at Hites's Cove, further up the river, but these were not represented by specimens at the Exhibition.

Peñon Blanco.—At Coulterville, and in its vicinity, the Mother lode is well defined and there are many promising claims. One of the most interesting locations is the Peñon Blanco, three miles northeast of the town, and on the divide, between Tuolumne and Merced rivers. This Peñon Blanco is a high hill, which is cut directly through by the vein; and the masses of white quartz standing out over the summit make it a prominent landmark for miles along the course of the great vein.

This claim is 5,850 feet long; course of the vein, north 36° west; dip easterly, 47°; average thickness of vein, 20 feet. The croppings rise from 5 to 30 feet above the surface. In some parts of the vein it is divided up by masses of slate. There are two principal ore-shoots, plunging southward. Very little work has yet been done upon the claim.

TUOLUMNE COUNTY.

App's mine.—This is upon the great vein near Jamestown. (Specimens Nos. 102 and 103.) It was worked irregularly between the years 1856 and 1859, but has since been regularly worked, with a very uniform yield of the quartz. From May 1, 1859, to September 1, 1866, 8,027 tons of ore were crushed, and yielded an aggregate of $124,575, averaging $15 52 per ton. The expenses of mining and milling are said to have averaged $7 47 per ton.

Raw-hide Ranch mine.—(Specimen No. 106.) This mine is also upon

the great vein, and was purchased in 1866 by parties in New York. The vein in the deepest shaft (200 feet) is said to be 10 feet wide. About 1,500 tons of ore were extracted in 1866. Some portions of the vein are very highly charged with gold, in an extremely divided state. The quartz has a greenish blue tinge, and is very hard. Large quantities of rich tellurium ore, rich in gold, have been discovered in it.

Golden Rule mine.—In 1866, 3,000 tons of ore were extracted from this mine, and yielded $32,554; an average of $10 75 per ton.

Chaparral Hill and other mines.—The collection contained specimens of the ores of the Chaparral Hill, the Bacon, Monte Christo, Buchanan, Consuelo, and other mines; but no statistics of their production or yield are accessible in season for this report.

Soulsby mine.—This mine is opened upon a narrow but very well-defined vertical vein, cutting granitic rocks, and highly charged with sulphurets of iron and lead, and rich in free gold. It has been successfully worked for a long time, and has yielded more than $1,200,000 in bullion. The pay ore has been traced for 1,700 feet in length. It has yielded about $400,000 during the past three years. The specimens (Nos. 110 and 111) contain galena and iron pyrites, with free gold, and more nearly resemble the gold ores of Colorado than any other specimens from California.

CALAVERAS COUNTY.

Carson Hill mine.—This claim was represented by some rich specimens, contributed by R. H. Sinton, esq. The quartz is hard and resinous in lustre, and the gold is extremely coarse and heavy. The vein is noted for its great size and for the large masses of gold which have been broken from it. It is upon the line of the great vein, and forms the connecting link between the mines of Tuolumne county and those of Angel's camp. The outcrops of quartz are very heavy, and stand boldly out upon the top of a high hill. In the early days of mining the slopes of this hill were crowded with miners, working over the surface soil for the large masses of ragged vein gold found in it, and which doubtless came from the breaking down of the vein.

The pits along the outcrop of the vein had not been sunk over 130 feet in depth before the property became involved in litigation upon conflicting claims, and has so remained until the last year, when preparations were made for commencing a methodical and thorough development of the ground. Some of the largest masses of native gold ever seen were taken out of the quartz of this vein.

The gold is associated with tetrahedrite, highly argentiferous, giving crusts of chloride of silver by its decomposition, and staining the quartz blue by the formation of blue carbonate of copper. This blue color in the vein is regarded as an unfailing indication of the presence of gold. It is found at several other points upon the great Mother vein, as, for example, at the Emily and the Pine Tree. At the Melones and Stanislaus mine, near this claim, there are some interesting ores, containing tellurium combined with silver and gold.

South Carolina claim.—This is in the immediate vicinity of the Carson Hill claim, and has yielded a large amount of gold, which appears to be found in a soft greenish or talcose slate, alongside of the great outcrop of quartz which traverses the claim.

Angel's Camp mines.—Several adjoining claims from this region were represented by specimens, all having a general similarity. These claims are known as Hill's, Slocum and Bell's, Cameron's, and Winter's, (now Bovee's.) The ore is peculiar, being generally a mixture of quartz and magnesite or dolomite, highly charged with bright glancing crystals of iron pyrites, often extremely rich in gold. Gold is also found free in the magnesite, and is very pure. No reliable statistics of the total production of these claims are obtainable. Much difficulty has been experienced in working the ore, owing to the refractory character of the sulphurets, which require to be decomposed before the gold can be obtained.

AMADOR COUNTY.

Coney mine.—This mine is remarkable for the quantity and richness of the sulphurets in the quartz. Until recently these sulphurets have been shipped to Europe and sold, but they are now worked upon the spot by the chlorination process of Professor Plattner.

Keystone mine.—(Specimen No. 114.) The quartz from this mine much resembles that from the Princeton vein. This mine was vigorously worked in 1866, and some 9,000 tons of ore were raised and milled, yielding $175,000. The yield of the mine since 1851 has been about $1,100,000. A new 20-stamp mill was erected in 1866, and other improvements made, at a cost of $75,000, besides which $50,000 were divided among the owners.

Hayward's mine, Sutter creek.—This mine, known also as the Eureka, was opened in 1853, and the main shaft had reached a depth of 1,230 feet at the end of 1866.

The vein traverses metamorphic rocks, conformably to the bedding. The hanging wall is a hard rock, resembling greenstone in color and texture, but probably metamorphic, and the foot wall is a soft black slate. This is one of the thickest veins in California, requiring timbers from 18 to 20 feet in length to reach from wall to wall after the extraction of the quartz. The average thickness of vein may be considered as about 16 feet, and the length, horizontally, of the pay shoot is not over 450 or 500 feet. The mine at this great depth is remarkably free from water, the lowest levels being dryer than the upper. This, together with the great size of the vein, permits the quartz to be mined very cheaply. Levels are run, one below another, at intervals of 100 feet, and the quartz is found to increase rather than to diminish in value in descending.

The yield of the mine in 1866 was about $450,000, and the gross product, since its opening, is believed to be not less than $3,000,000. The ore of the lower portions probably averages $15 to $17 per ton. The per-

centage of sulphurets in the quartz is small, and free gold, in grains large enough to be distinctly seen, is not common. This mine has recently become the property of a joint stock company—the Amador Mining Company—and is represented by 3,700 shares, at a par value of $400. The bullion returns during two weeks in October, 1867, amounted to $16,580. It was incorporated October 1, 1867, and since that time, to the end of the year, produced $111,826 63 in bullion; the dividends disbursed during the same period amounted to $66,600. The receipts in December were $35,121 33. The quantity of ore reduced during the last three months of the year was 5,018 tons. The average value of the ore for 13 months was $22 06 per ton. The cost of mining and milling was $6 06; leaving a profit of $16 per ton. This stock has never been assessed. It has been sold as low as $200 per share.

NEVADA COUNTY, GRASS VALLEY DISTRICT.

The Grass Valley district is one of the oldest and most important quartz mining sections of California, and has produced about $25,000,000 of gold during the last fourteen years. The veins are generally narrow, but rich, and carry coarse, free gold, associated with sulphurets of iron and lead. They traverse hard dioritic and granitic rocks, which are probably metamorphic.

Eureka mine.—This is one of the most remarkable and profitable mines in California. It was first opened in 1854, and was worked at intervals for several years with little or no profit, but was reopened a few years since, and then sold to parties who sunk a shaft to the depth of 300 feet, and found the vein to constantly increase in richness. The gross yield of bullion for 1866 amounted to $596,053; of this $360,000, or an average of $30,000 a month, were divided among the shareholders, besides considerable expenditures in permanent improvements. This amount was extracted from 12,200 tons of ore, giving an average yield of $48 per ton. The total production of the mine from October 25, 1865, to April 17, 1867, was $825,926.

North Star mine.—This mine is worked to a depth of 750 feet, (upon the vein,) and 600 to 800 feet longitudinally. Over $500,000 has been realized in profits during the past five years. The gross product of a new 16-stamp mill in 1866 for five months was over $100,000, and the profits divided ranged from $12,000 to $14,000 per month.

Ophir mine.—This mine is said to have yielded about $1,000,000 from 1852 to 1864. In 1866 some 3,750 tons of ore were reduced, producing about $175,000, or an average of $47 per ton.

Gold Hill.—This is one of the oldest quartz mining localities in California, and is popularly believed to have yielded some $4,000,000 during the fourteen years ending in 1864. The vein is considered to be the continuation of the famous Watt vein upon Massachusetts Hill, some 500 feet south of it, which yielded a net profit of $960,000 in three years.

Other mines.—Many of the important mines of the Grass Valley district, and of the county, were not represented in the collection at Paris. There were a few specimens from the Norambagua, the Lone Jack, the Providence, and the Lone Star.

The report of the county assessor for the year 1865 states the number of mines in the county as 117. Many of these were merely prospective. There were 71 mills—51 for crushing and working quartz, and 20 for crushing cement gravel. The yield of 19 mines, fully reported, was $2,227,000. Twenty-three of the mills had crushed an aggregate amount of 70,760 tons.

YUBA COUNTY.

Jefferson mine.—Specimens 157 to 164. The quartz from this vein is white and friable, some of the best ore being in a powdered state when extracted. The vein is about six feet wide, and is enclosed in metamorphic rocks, dipping to the east at an angle of about 45°. Course, nearly north and south. It is worked to a depth of 450 feet, (1866,) and has eight levels, the lowest 100 feet apart. There are two or more chimneys of superior ore, and they plunge northwards. About 1,000 tons of ore are worked monthly, and the average yield per ton for the year was $18. The whole cost of raising and working is estimated to be $4 50 per ton, thus leaving a profit of $13 50, or about $13,500 a month.

Pennsylvania.—This mine joins the preceding, and has similar ore. It was represented by specimens 164 to 167. The claim is 1,300 feet in length, and the shaft had been sunk to a depth of 410 feet at the end of 1866. The vein at the bottom of the shaft is nine feet thick, and the best ore is said to average $20 per ton. It is worked by a mill of eight stamps, located at the mouth of the mine.

SIERRA COUNTY.

Sierra Buttes mine.—This justly celebrated mine is located on the south fork of the Yuba river, about 12 miles from Downieville, and was represented by suites of specimens, selected by the writer, from the different parts of the mine, (Nos. 167 to 187.) The claim is 3,000 feet in length, and it is estimated to be at an elevation of 6,000 feet above tide. The vein traverses hard metamorphic slates, and is divided into three branches, each of which is worked. The thickness of these veins, where united, varies from 16 to 30 feet, but the usual thickness of the branches is from 6 to 8 and 12 feet. It is so situated upon the steep slope of the mountain that it can be worked by tunnels, one below another, to a very great depth. There are now four principal tunnels upon the course of the veins, the lowest being at a depth of about 750 feet from the top of the outcrop where it passes the crest of the hill. The vein is cut also by a fifth tunnel, about 400 feet lower, thus showing the permanence of the vein at a depth of about 1,100 feet.

The gross yield of the mine from 1861 to 1866, inclusive, was $1,34 5,0 00

the expenses were $460,000, and the profits divided among the owners, from 1856 to 1867, were $884,400, as follows:

Yield of the Sierra Buttes mine.

Year.	Gross.	Expenses.	Profits.
1857, (6 months)	$51,000	$14,600	$36,400
1858	88,000	20,000	68,000
1859	55,000	15,000	40,000
1860	120,000	37,000	83,000
1861	198,000	44,000	154,000
1862	164,000	52,000	112,000
1863	158,000	58,000	100,000
1864	90,000	75,000	15,000
1865	198,000	66,000	132,000
1866	223,000	79,000	144,000
Totals	$1,345,000	$460,600	$884,400

The low yield and small profits of 1864 are explained by the drought of that year, which necessitated the construction of a long flume, at a cost of $40,000, to bring water for the mills. The quartz, as worked, has averaged from $16 to $18 per ton, but large quantities of lower grade ore are left standing in the mine.

Independence mine.—This mine is upon the prolongation of the Sierra Buttes vein, and was represented by specimens 187 to 189. It is a very large vein, averaging about 20 feet in thickness for about 300 feet. The paying portion is about 400 feet long, and it has been stoped out down to the lowest tunnel. The quartz is hard, and yields an average of $8 per ton. The estimated cost of working and raising is $5, thus leaving a profit of $3 per ton. Thirty tons are worked a day in a 24-stamp mill.

Keystone mine.—This mine is reported to have given a monthly yield of $8,000 to $10,000 during 1866, about half of which was profit. The ore is reported to average $15 per ton.

Barnhardt and other mines.—The Barnhardt claim, the Primrose, Belzona, Four Hills, Fac Simile, Mexican, and other mines of the region were represented by specimens contributed by Messrs. Crossman & Cochrane, of Downieville.

PLUMAS COUNTY.

The mines of this county were not represented by specimens as fully as they should have been. The Crescent mine of Indian valley has a good reputation, and is reported to have yielded over $100,000 in 1865.

King's mine was represented by a specimen of semi-opal containing free gold; interesting as an evidence of the aqueous origin of gold in veins.

SOFT OCHERY SLATES CONTAINING GOLD.

Attention has recently been directed to a class of gold deposits hitherto unknown or neglected in California, they having been supposed to be the outcrops or indications of deposits of copper ore merely, and were explored as such. They appear upon the surface as extensive outcrops of soft ferruginous slate of a dark red or brown color. Some of these deposits on being prospected and worked have been found to contain gold in sufficient quantities to encourage working.

These deposits occur in the foot-hills of the Sierra Nevada, a little west of the main gold belt, and in the zone known as the "copper belt," along which many large deposits of copper have been found under similar outcrops.

These outcrops are usually not accompanied by any well-defined lode of quartz, but the rocks are "mineralized" in a high degree, and are so much softened and decayed in places that they can be readily excavated with a shovel. The external surface is more highly rusted than the interior, which displays a variety of colors, from pure white to bright red and brown.

The suite of specimens Nos. 204 to 211 represented these extraordinary ores.

Harpending claim, near Lincoln, in Placer county.—The outcrop forms an isolated hill, rising from 80 to 100 feet above the plain, and about 200 feet wide and 500 long. It is excavated in open cutting or quarried out, the softness of the material permitting it to be worked with ease and at a very small cost. It is milled upon the spot, very coarse grates being used, and the pulp is ground after passing the battery. A 40-stamp mill has been erected at the locality during the past year.

Other and similar deposits are being explored in Calaveras county, the most prominent being at Quail Hill, near Telegraph City, where the soft slates give encouraging returns in gold and silver by working tests. Ten samples of about five pounds each gave an average result of: gold, $17 08; silver, $5 82; total, $22 90. The average yield of a sample from the inclined shaft was $35 87. A 20-stamp mill has been erected upon the property, but in working on a large scale the returns have not been equal to the expectations of the proprietors. These deposits are in many respects similar to the famous "Pigeon Roost streak" of Lumpkin county, Georgia, where a zone of rotten slates, but containing quartz, has furnished gold, by sluicing, for many years past.

PLACERS—CEMENT DEPOSITS.

The great bulk of California gold has been, and still is, obtained from placers—the natural deposits of the debris of pre-existing quartz veins which have been cut and washed away by the action of running water. When we contemplate the enormous amount of surface erosion throughout California, and see valleys excavated by rivers to a depth of 2,500

or 3,000 feet below the general surface of the country, it is not so difficult to admit that all placer gold has been broken from veins.

The great placer region of California is found in the central counties, from Mariposa to Butte county, inclusive. The deposits are not confined to the beds of streams alone, but are followed upon the tops of the hills, and give indisputable evidence of being the remains of ancient watercourses or river channels, formed when the direction of the drainage of the country was very different from the present. Some of these ancient deposits are buried under enormous accumulations of sand, clay, gravel, and sometimes of tufa and lava; and the rounded, river-worn boulders and stones are thoroughly cemented together, so as to form a solid conglomerate—a pudding-stone, the "cement" of the miners. This agglomeration or cementing appears to have been effected chiefly by the percolation or presence of either silicious, calcareous, or ferruginous waters. The first two, acting at considerable depths beyond the access of air, give bluish-green cements, the iron being in the state of protoxyd; but the ferruginous waters with access of air produce rusty or reddish-brown cements. The former are known by the miners as the *blue leads* and the latter as the *red leads*. Cements of a gray color are also found. Specimens of each were in the Exhibition, and some of them were rich in gold, the grains being as firmly imbedded or cemented in the mass as the pebbles. The collection contained characteristic specimens of each of these varieties of cement. It is the popular belief that there is one great *Blue lead* extending across several counties of the State, nearly at right angles with the present rivers. It is probable, however, that there are many independent channels having the same general appearance. Efforts are making to trace out the courses of these ancient deposits, and a map of Sierra county, showing the probable position of the old rivers relatively to those now existing, was prepared and published in May last, and sent to the Exposition by J. H. Crossman, esq., of Downieville. Blue, gray, and red deposits are found in that county, and they are regarded as the deposits of as many different streams or ancient rivers.

The Blue lead is formed of a deposit of gravel and boulders, varying in size from a grain of wheat to masses of many tons weight. This fills the entire channel, from 700 to 1,000 feet in width. The gold is usually coarse and abundant, and has a high degree of fineness. The richest portion of the deposit is commonly not over three feet in thickness, and rests upon the bed or foundation rock. The miner upon the Blue lead always cuts away a portion of the bed rock together with the gravel, as the rock is very rich and quite soft. The whole is trammed to the dump at the mouth of the tunnel, to be washed in sluices.

Mr. Crossman regards the red lead as probably the high bars or banks of the ancient rivers, for the deposits cover a considerable area, and are generally parallel with the main channel. The boulders are not so large and the gravel not so rich as in the deep or blue channel. It has been observed, also, that the gold is not as fine.

Mr. Crossman furnishes the following estimate of the yield of one mile in length of the Blue lead, from Forest City southward. The work was commenced in 1854, and the claims were exhausted in 1860, except a few, which are still very remunerative. These claims were worked by tunnels, and in a hurried manner, so that perhaps one-third of the gold was left behind. It is probable that the gronnd will eventually be re-worked by the hydraulic method. The expense attending the extraction in the properties enumerated is said not to have exceeded one-third of the gross proceeds, two-thirds being divided among the shareholders.

Estimated yield of one mile of the Blue lead.

Name of claim.	Yield.	Name of claim.	Yield.
Live Yankee	$300,000	Red Stay	$150,000
Buckeye	200,000	Packard	150,000
Empire Company	240,000	Jenny Lind	60,000
Dutch Company	40,000	Hook & Ball	150,000
Seven small claims	25,000	Blue Tunnel	70,000
Little Rock	100,000	Keystone	50,000
Can't Get Away	50,000	Alleghany	200,000
Do Say	200,000	Pacific	400,000
Washington	200,000	Bay State	100,000
Monte Christo	150,000	New York Branch	50,000
Gordon Gates	50,000	New York	250,000
Monumental	100,000	N. Weston	75,000
Knickerbocker	100,000	Cumberland	50,000
Uncle Sam	150,000	Unica	200,000
American Company	50,000	Excelsior	225,000
Manhattan	50,000	Eureka	200,000
None-such	50,000	Tremont	400,000
Masonic	150,000		
Highland	100,000	Total	$5,055,000
Ohio	50,000		

One of the best examples of placer mining, on a large scale, is found at the claim of the Blue Gravel Mining Company at Smartsville, in Yuba county. This claim covers an area of 100 acres, with an average depth of deposit of 100 feet. The channel of the ancient stream is from 100 to 400 feet wide. A tunnel to reach the channel was commenced in 1855, and completed, after much difficulty and great expense, in 1864. The company has four miles of sluices, three feet wide and three feet deep, with an inclination of six and one-half inches in 12 feet. The bed of the sluice on which the gold is caught is made of alternate sections of wooden blocks, 17 inches long, and of rock 24 inches long, (measured along the sluice.) Three tons of quicksilver are used in the flume. Five hundred inches of water are used, at a cost of $75 per day. The sluice is cleaned up once in eight or ten weeks, and the results of the several runs, from the opening of the tunnel till the end of 1866, were as follows:

Results of sluicing—Blue Gravel Mining Company.

Month.	Amount.	Month.	Amount.
March, 1864	$9,381	August	$24,679
May	24,275	September	46,500
June	70,000	October	26,660
July	22,350	December	37,000
August	3,487	February, 1866	23,746
September	49,440	April	43,428
October	24,669	June	23,880
December	45,003	August	42,494
January, 1865	2,723	October	18,000
February	24,051	December	25,000
March	44,981		
May	24,000	Total	$642,860
June	50,118		

In order to extract the gold from the very hard cements which will not disintegrate by exposure to the sun and air during the dry season, recourse is had to stamp-mills, known as cement-mills. These are like ordinary quartz-mills, except that the grates are made very coarse and heavy, and a much greater flow of water is used. The number of such mills is now very great, and is increasing.

STATISTICS OF THE PRODUCTION AND MOVEMENT OF GOLD PRODUCED IN CALIFORNIA AND OTHER PACIFIC STATES AND TERRITORIES.

The receipts of uncoined bullion at San Francisco, from the interior of California, include also the bullion from the State of Nevada. We may therefore ascertain approximately the value of the gold production of California by subtracting from the total receipts the value of the Nevada bullion. There is a small production of silver bullion within the limits of the State; but as this is inconsiderable compared with the gold product, and as there are no reliable figures or estimate of the amount of this silver bullion, no attempt is made to segregate it from the total bullion returns. The shipment of treasure from the interior consists largely of coin, and this also must be subtracted. The following table shows the total receipts of treasure at San Francisco, both coined and uncoined, from the interior of California during the four quarters of the years 1864, 1865, 1866, and 1867, and comprises the aggregate for the whole of each year.[1]

[1] For these statistics, and for some of the following tables of production and export, I am indebted to Carmany's Review of the Mining, Agricultural, and Commercial Interests of the Pacific States for the year 1866, and to the Mercantile Gazette of January, 1867. Copies of the former were contributed by Mr. Carmany for distribution at the Exposition.

Receipts of treasure, coined and uncoined, at San Francisco, from the interior of California, during the four quarters of the years 1864, 1865, 1866, *and* 1867, *and comprising the aggregate of the same for the whole of each year.*

Months.	From the northern mines.			From the southern mines.		
	Uncoined.	Coined.	Total.	Uncoined.	Coined.	Total.
1864.						
October	$2, 742, 682	$980, 315	$3, 022, 997	$461, 907	$138, 972	$600, 879
November	2, 543, 755	318, 530	2, 862, 286	400, 773	149, 806	550, 579
December	2, 660, 792	392, 453	3, 053, 175	361, 411	162, 770	524, 189
Fourth quarter	7, 947, 159	991, 298	8, 938, 457	1, 294, 111	451, 548	1, 675, 659
Third quarter	8, 115, 081	994, 595	9, 109, 676	1, 334, 110	378, 848	1, 712, 958
Second quarter	10, 116, 501	790, 570	10, 907, 071	1, 449, 762	285, 960	1, 735, 722
First quarter	8, 603, 571	1, 043, 487	9, 647, 058	1, 339, 795	394, 019	1, 733, 814
Total for year	$34, 782, 312	$3, 819, 950	$38, 602, 262	$5, 347, 778	$1, 510, 375	$6, 858, 153
1865.						
October	$2, 688, 079	$225, 977	$2, 914, 056	$437, 274	$156, 642	$593, 916
November	2, 614, 218	250, 853	2, 865, 071	373, 433	122, 935	496, 368
December	2, 181, 064	281, 630	2, 462, 694	311, 159	95, 634	406, 793
Fourth quarter	7, 483, 361	758, 460	8, 241, 821	1, 121, 866	375, 211	1, 497, 077
Third quarter	8, 532, 457	669, 236	9, 201. 693	1, 237, 291	319, 028	1, 556, 319
Second quarter	10, 526, 257	762, 750	11, 289, 007	1, 407, 048	301, 578	1, 708, 626
First quarter	10, 107, 262	902, 664	11, 009, 926	1, 342, 208	324, 730	1, 666, 938
Total for year	$36, 649, 337	$3, 093, 110	$39, 742, 447	$5, 108, 413	$1, 320, 547	$6, 428, 960
1866.						
October	$3, 128, 320	$198, 420	$3, 326, 740	$488, 450	$87, 614	$576, 064
November	2, 621, 219	196, 337	2, 817, 556	490, 300	92, 330	582, 630
December	2, 595, 531	200, 512	2, 796, 043	486, 600	86, 019	572, 619
Fourth quarter	8, 345, 070	595, 269	8, 940, 339	1, 465, 350	265, 963	1, 731, 313
Third quarter	9, 254, 509	929, 540	10, 184, 049	872, 417	247, 635	1, 120, 052
Second quarter	9, 832, 214	1, 190, 458	11, 022, 672	920, 508	267, 909	1, 188, 417
First quarter	7, 760, 962	807, 318	8, 568, 280	848, 700	261, 267	1, 109, 967
Total for year	$35, 192, 755	$3, 522, 585	$38, 715, 340	$4, 106, 975	$1, 042, 774	$5, 149, 749
1867.						
January	$3, 077, 269	$439, 264	$3, 516, 533	$220, 367	$166, 707	$387, 074
February	2, 262, 155	265, 857	2, 528, 012	203, 918	57, 452	261, 370
March	2, 719, 436	281, 876	3, 001, 312	203, 250	98, 674	301, 994
April	3, 943, 605	246, 910	4, 190, 515	287, 478	123, 275	410, 753
May	3, 521, 435	250, 354	3, 771, 789	290, 543	130, 600	421, 143
June	3, 465, 576	273, 403	3, 738, 979	314, 402	114, 107	428, 509
July	3, 701, 611	291, 524	3, 993, 135	309, 661	87, 910	397, 571
August	3, 736, 035	209, 890	3, 945, 925	262, 188	75, 825	338, 013
September	3, 101, 754	185, 920	3, 287, 674	237, 027	104, 969	341, 996
October	3, 082, 637	307, 219	3, 389, 856	263, 728	132, 028	395, 757
November	2, 968, 419	253, 263	3, 221, 682	254, 921	184, 837	439, 758
December	1, 998, 695	343, 202	2, 341, 897	165, 873	187, 721	353, 594
Total for year	$37, 578 627	$3, 348, 682	$40, 927, 309	$3, 013, 356	$1, 464, 105	$4, 477, 461

The totals of the uncoined bullion receipts are as below for the years named, and by subtracting from each the bullion product of Nevada for the corresponding years, we obtain, approximately, the gold yield of the State, to which, however, ten per cent. should be added to cover bullion which may be taken to San Francisco in the pockets of miners, and not manifested:

Gold product of California.

	1864.	1865.	1866.	1867.
Uncoined bullion, northern and southern	$40, 130, 080	$41, 757, 750	$39, 299, 730	$40, 591, 983
Nevada bullion	16, 000, 000	16, 800, 000	16, 500, 000	18, 000, 000
	$24, 130, 080	$24, 957, 750	$22, 799, 730	$22, 591, 983
Add ten per cent	2, 413, 008	2, 495, 775	2, 299, 973	2, 259, 198
Total gold product for each year	$26, 543, 088	$27, 453, 525	$25, 079, 703	$24, 851, 181

The following table shows the receipts of bullion and coin at the port of San Francisco from northern ports, chiefly Portland, in Oregon, and from British Columbia and Mexico, for the past three years:

Coastwise bullion receipts.

Year.	Uncoined.	Coined.	Total.
1865—January	$333, 123	$128, 611	$461, 734
February	219, 926	59, 978	279, 904
March	167, 411	40, 911	208, 322
April	291, 949	60, 873	352, 822
May	362, 150	47, 975	410, 134
June	791, 928	52, 669	844, 597
July	823, 641	31, 269	854, 910
August	786, 558	32, 241	818, 799
September	954, 813	28, 876	983, 689
October	634, 116	23, 864	657, 980
November	794, 085	16, 818	810, 903
December	788, 802	24, 180	812, 982
Total	$6, 948, 511	$548, 265	$7, 496, 776
1866—January	257, 930	30, 853	288, 783
February	174, 219	80, 972	255, 191
March	197, 023	20, 577	217, 600
April	274, 620	29, 974	304, 594
May	411, 427	90, 956	502, 383
June	460, 132	42, 388	502, 520
July	680, 953	37, 591	718, 544
August	932, 392	56, 959	989, 351
September	621, 426	7, 618	629, 044
October	559, 212	54, 055	613, 267
November	412, 183	45, 306	457, 483
December	415, 583	32, 193	447, 776
Total	$5, 397, 100	$529, 436	$5, 926, 536

Coastwise bullion receipts—Continued.

Year.	Uncoined.	Coined.	Total.
1867—January	$344,440	$15,381	$359,821
February	128,799	10,884	139,683
March	119,398	23,284	142,682
April	344,075	7,450	351,525
May	380,780	11,636	392,416
June	366,265	8,976	375,241
July	760,693	214,744	975,437
August	1,006,186	2,536	1,008,722
September	490,853	5,556	496,409
October	744,349	80,980	825,329
November	536,548	100,520	637,068
December	442,951	45,450	488,401
Total	$5,665,337	$527,397	$6,192,734

The amount of treasure exported from San Francisco in 1865 was $45,308,228, and in 1866 $44,364,393; showing a decrease of $943,835. The decrease for 1867 was much greater, as will be seen by the annexed table, which shows the amount and destination of the exports of treasure from the port of San Francisco for 1867, as declared at the custom-house:

Statement of the amount and destination of treasure exported from San Francisco during the year ending December 31, 1867, *as declared at the custom-house.*

TO NEW YORK.

In January	$2,809,235 55	
In February	1,396,207 24	
In March	1,646,058 86	
In April	1,186,780 34	
In May	2,535,232 56	
In June	2,661,643 57	
In July	2,389,686 29	
In August	1,610,041 45	
In September	1,337,755 30	
In October	1,024,552 18	
In November	1,957,828 43	
In December	2,800,881 68	
		$23,355,903 45

TO ENGLAND.

In January	$703,070 85	
In February	384,098 00	
In March	557,661 60	
In April	297,174 02	
In May	788,772 13	
In June	502,834 36	
In July	616 302 22	
In August	515,691 91	
In September	493,965 34	
In October	704,600 43	
In November	321,514 42	
In December	156,408 71	
		$5,841,183 99

TO FRANCE.

In January	$122,331 56	
In February	105,079 91	
In March	67,000 00	
In April	69,537 25	
In May	101,509 48	
In June	117,400 57	
In July	183,751 64	
In August	234,905 70	
In September	106,600 42	
In October	34,772 40	
In November	65,555 27	
In December	74,791 53	
		$1,283,235 73

TO CHINA.

In January	$806,076 27	
In February	376,206 32	
In March	110,642 72	
In April	1,081,513 57	
In May	760,027 73	
In June	698,933 73	
In July	1,746,078 69	
In August	385,540 53	
In September	1,180,308 18	
In October	1,119,629 84	
In December	766,546 77	
		$9,031,504 35

Statement of the amount and destination of treasure, &c.—Continued.

TO JAPAN.

In January	$21,685 46	
In March	10,000 90	
In April	2,238 72	
In May	2,845 00	
In July	1,100 00	
In September	10,000 00	
In October	650 00	
In December	593,430 34	
		$641,949 52

TO PANAMA.

In January	$30,000 00	
In February	30,000 00	
In March	30,000 00	
In April	29,000 00	
In May	30,000 00	
In June	30,000 00	
In July	30,000 00	
In August	32,127 40	
In September	40,000 00	
In October	30,000 00	
In November	31,424 30	
In December	30,000 00	
		372,551 70

TO CENTRAL AMERICA.

In February	$20,000 00	
In April	45,550 00	
In May	28,400 00	
In June	8,000 00	
In July	3,000 00	
In October	8,660 00	
In December	58,370 00	
		$171,980 00

TO HAWAIIAN ISLANDS.

In April	$1,300 00	
In June	1,000 09	
In July	1,000 00	
In August	5,000 00	
In October	18,906 00	
In November	29,826 42	
		$57,032 45

TO MEXICO.

In January	10,000 00	
In February	3,000 00	
In March	13,000 00	
In October	5,000 00	
In December	11,000 00	
		42,000 00

TO VALPARAISO.

In February	$399,849 08	
In March	323,601 89	
		723,450 97

TO TAHITI.

In February	500 00

TO VICTORIA.

In February	$50,000 00	
In October	80,000 00	
In December	25,000 00	
		155,000 00
Total, 1867		$41,676,722 16
Total, 1866		44,364,393 05
Decrease, 1867		$2,688,100 89

The following table shows the value and destination of treasure shipments from San Francisco during the past 14 years—1854 to 1867 inclusive:

Treasure shipment from California.

Years.	Eastern ports.	England.	China.	Panama.	Other ports.	Totals
1854	$46,533,166	$3,781,080	$965,887	$204,592	$560,908	$52,045,633
1855	38,730,564	5,182,156	889,675	231,207	128,129	45,161,731
1856	39,895,294	8,666,289	1,308,852	253,268	573,732	50,697,434
1857	35,531,778	9,347,743	2,993,264	410,929	692,978	48,976,692
1858	35,891,236	9,265,739	1,916,007	299,265	175,779	47,548,026
1859	40,146,437	3,910,930	3,100,756	279,949	202,390	47,640,462
1860	35,719,296	2,672,936	3,374,680	300,819	258,185	42,325,916
1861	32,628,011	4,061,779	3,541,279	349,769	95,920	40,676,758
1862	26,194,035	12,950,140	2,660,754	434,508	322,324	42,561,761
1863	10,389,330	28,467,256	4,206,370	2,503,296	505,667	46,071,920
1864	13,316,122	34,436,423	7,888,973	378,795	686,888	56,707,201
1865	20,583,390	15,432,639	6,693,522	1,224,845	1,103,832	45,308,227
1866	29,244,891	6,532,208	6,527,287	511,550	1,548,457	44,364,393
1867	23,355,903	5,841,184	9,031,504	372,552	3,075,149	41,676,292
Totals	$428,159,453	$150,548,502	$55,368,810	$7,755,344	$9,930,338	$651,762,446

It is not possible to give the exports of the years previous to 1854 with so much accuracy. The records of the custom-house were destroyed

in the fire of May, 1851, and the figures usually given of the production from the time of the discovery of gold in 1848 to May, 1851, are approximations. It is believed that the exports up to 1850, inclusive, amounted to $66,000,000, and for the first four months of 1851, to May, $11,497,000.[1] The total exports from 1848 to 1867, inclusive, may be summed up as follows:[2]

Exports of treasure from San Francisco, 1848 to 1868.

1848 to 1851	$66, 000, 000	1859	$47, 640, 462
1851, to May 1, (estimate)	11, 497, 000	1860	42, 325, 916
1851, (8 months)	34, 492, 000	1861	40, 676, 758
1852	45, 779, 000	1862	42, 561, 761
1853	54, 965, 000	1863	46, 071, 920
1854	52, 045, 633	1864	56, 707, 201
1855	45, 161, 731	1865	45, 308, 227
1856	50, 697, 434	1866	44, 364, 393
1857	48, 976, 692	1867	41, 676, 292
1858	47, 548, 026	Total	$864, 495, 446

There is doubtless a considerable amount of bullion and of coin carried out of the port of San Francisco by passengers of which no account is given. The value of this unmanifested bullion and coin has been variously estimated; Commissioner Browne considered that it might be $200,000,000 up to the end of 1865,[3] but this was probably an over estimate. It is usual to make an addition of 10 per cent. to the recorded shipments of bullion from the interior of the State to San Francisco, so as to cover the bullion and coin brought down by miners and others, and thus not entered on the books of the express companies. Such an allowance upon the total bullion export as recorded would be ample, for there is no doubt that the proportion of unmanifested bullion sent out of the State is far less than that which arrives from the interior. Adding, therefore, this liberal allowance of 10 per cent. to the total manifested exports of treasure, and adding, also, an estimated amount of $45,000,000 to cover coin in circulation, and gold and silver used in the arts—spoons, table service, &c.—and subtracting from the total the amount of treasure received from British Columbia, Mexico, and other sources beyond the limits of the United States, we shall obtain a close approximation to the

[1] Mining Magazine, January, 1857; vol. viii, p. 193.

[2] In making up this tabular statement I have adopted, for the period from 1854 to 1867, inclusive, the figures published in the Mercantile Gazette, and Carmany's Review. For the previous years I have taken the returns and estimates published in the Mining Magazine vol. viii, p 193. All these figures differ somewhat from those published by Commissioner Browne. For the year 1853, for example, Mr. Browne gives the production as $57,330,034 and for 1864, $55,707,201.

[3] Mineral Resources of the United States, 1867.

total value of the production of the precious metals upon the Pacific coast of the United States, from 1848 to 1868, being $961,000,000, as shown below:

Total manifested exports of bullion	$864,495,446
Add for unmanifested exports, (estimated at 10 per cent.)	86,449,544
Add for coin and gold and silver in use, estimate	45,000,000
	$995,944,990
Deduct receipts from British Columbia, Mexico and other sources, estimated in part	35,000,000
Approximate total production of the Pacific coast of the United States, 1848 inclusive, to 1868	$960,944,990
In round numbers	$961,000,000

It is difficult to ascertain what portion of this total should be credited to the State of California alone, but in order to arrive at an approximate estimate of it, the production of Nevada, Idaho, Oregon, and Washington, and other interior sources, must be deducted. Assuming this production to have been, in the aggregate, including the 10 per cent., $154,000,000, the remainder, $807,000,000, is an approximation to the value of the gold production of the State of California since the discovery of gold upon the American river in 1848.

QUARTZ MILLS.

The number of quartz mills in operation in the State in April, 1857, was 138, with an aggregate of 1,521 stamps; the cost of erection of which was $1,763,000. The number in operation November, 1858, was 279, with an average of 2,610 stamps, the cost of erection of which was $3,270,000. The number in operation January 1, 1867, was 411, of which 207 were propelled by steam, 186 by water, and 18 by steam and water. The aggregate number of stamps was 4,997, and the cost of the machinery was estimated at $5,900,000. In addition to the stamps, 419 arrastras were employed, of which 350 were connected with different quartz mills.

The following is a statement of the number of quartz mills in the State of California in 1866:[1]

[1] Langley's Pacific Coast Business Directory, 1867.

Tabular statement of quartz mills in California, 1866.

Location of mill.	Name of mill.	When erected.	No. stamps.	No. arrastras.	Power.	Cost.	Gold, silver, or cement.	Occupants in 1866.
ALPINE COUNTY.								
Markleeville	Pioneer	1863	10	.....	Steam	$50,000	Silver	Jones, Wade & Co.
Silver mountain	Star	1864	6	.....	....do	15,000	....do	W. Whitesides.
Do	Washington	1866	10	.....	... do	20,000	....do	G. Waslin, Mining and Mineral Co.
AMADOR COUNTY.								
Amador City	Amador	1856	10	.....	Steam	10,000	Gold	Middleton & Co.
Do	Bunker Hill	1855	8	.....	Steam and water	12,000	....do	William A. Palmer.
Do	Fleehart's	1866	10	.....	Steam	10,000	....do	Gardner & Fleehart.
Do	Hazard	1857	8	.....	Water	6,000	....do	Do.
Do	Keystone	1856	40	.....	Steam	40,000	....do	Gashwilder & Co.
Do	Spring Hill	1856	40	.....	Steam and water	40,000	....do	Hooper & Co.
Clinton	Rocky Falls	1865	10	.....	Steam	10,000	....do	W. J. Paugh.
Do	Union	1858	10	.....	....do	10,000	....do	E. T. Steen.
Drytown	Plymouth	1860	20	.....	Steam and water	20,000	....do	Hooper & Co.
Do	Potosi	1857	16	.....	Water	10,000	....do	Creed & Wood.
Do	Seaton	1865	20	.....	Steam and water	100,000	....do	Seaton Mining Company.
Fiddletown	Richmond	1865	10	.....	....do	10,000	....do	Eagan & Co.
Jackson	Coney's	1864	16	.....	Steam	10,000	....do	C. T. Meader.
Do	Hubbard's	1860	10	.....	Water	8,000	....do	S. C. Fogus.
Do	Kearsing's	1862	10	.....	....do	5,000	....do	C. T. Meader.
Do	Tubbs's	1866	10	.....	Steam	10,000	....do	Tubbs & Co.
Do	Oneida	1854	40	.....	....do	40,000	....do	James Morgan.
Lower Randiccia	Italian	1864	4	.....	....do	7,500	....do	Bruno & Co.
Pine Grove	Tellurium	1864	10	.....	....do	10,000	....do	Cushing, Ryder & Co.
Rancheria	Loyal League	1858	20	.....	Water	15,000	....do	Hurst & Co.
Sutter creek	Badger	1858	16	.....	....do	10,000	....do	A. Hayward.

Do	Downs's	1858	10		do	10,000	do	R. C. Downs.
Do	Eureka	1858	40		Steam and water	40,000	do	A. Hayward.
Do	Lincoln Quartz Mining Company		20		Water	10,000	do	R. C. Downs, superintendent.
Do	Mahoney	1859	16		do	15,000	do	Mahoney Brothers.
Do	Meader	1866	20		do	20,000	do	C. T. Meader.
Do	Wildman's	1859	12		do	10,000	do	C. T. Wheeler.
Volcano	Belding	1865	10		Steam and water	12,000	do	California Furnace Company.
Do	Eagle	1858	10		do	9,000	do	—— Pine, superintendent.
Do	Fogus's	1865	10		Water	10,000	do	J. T. Farley.
Do	Golden Gate	1865	10		Steam and water	20,000	do	Hurd & Co.
Do	Italian	1862	10		Water	8,000	do	Rose & Co.
Do	Monday	1860	20		do	4,000	do	Fogus & Co.
Do	Mitchell's	1863	20		Steam	20,000	do	Lawton & Co.
Do	Pioneer	1855	10		Steam and water	15,000	do	C. T. Meader.
Do	Sirocco	1860	20		do	20,000	do	J. T. Farley.
Do	Sulphuret	1864		2	do	9,000	do	W. H. Thoss.
Do	Tulloch	1865	15		Steam	8,000	do	Lawton & Co.
Do	do	1865	1	1	Water	5,000	do	Tulloch & Co.
Do	Tynan	1865	12		Steam	8,000	do	M. Tynan.
BUTTE COUNTY.								
Cherokee ravine	Binny & Co	1866	4		Steam	3,000	Gold	Binney & Co.
Jordan	Porter Mining Company	1865	12	1	do	20,000	do	E. C. Ross & Co.
Oregon City	Cambrian	1866	6		do	12,000	do	—— Halstead.
Do	Nesbit	1865	10		do	15,000	do	Nesbit & Co.
Oregon gulch	Sparks & Smith	1856	12	1	do	30,000	do	Oroville Gold and Silver Mining Co.
Virginia	Virginia	1856	10	4	do	15,000	do	A. H. Wells & Co.
Yankee Hill	'49 and '56 Quartz Mining Company	1857	15	4	do	15,000	do	H. N. Tilden.
CALAVERAS COUNTY.								
Altaville	Altaville Quartz Mining Company	1863	16		Water	15,000	Gold	N. Sarco, Prince & Co.
Angel camp	Hill's	1850	12		Steam	10,000	do	—— Hill.
Do	Southworth's	1856	17		do	20,000	do	D. Southworth.
Do	Stickles's	1866	12		Water	4,000	do	E. & G. Stickles.
Do	Winter's	1852	6		do	3,000	do	Winters & Bovee.
Angel creek	Angel Creek	1865	6		do		do	Spence & Co.

Tabular statement of quartz mills in California, 1866—Continued.

Location of mill.	Name of mill.	When erected.	No. stamps.	No. arrastras.	Power.	Cost.	Gold, silver, or cement.	Occupants in 1866.
Camp Flores	Flores	1861	12	.....	Steam	$18,000	Gold	Mina Rica Company.
Carson creek	Carson Creek	1864	10	.....	Water	10,000	....do	Jones & Co.
Cherokee Flat	Cherokee	1860	10	.....	Steam	3,000	....do	Cherokee Mining Company.
Copperopolis	Duncan's	1865	10	.....	....do	15,000	....do	Duncan & Co.
Do	Reservoir	1864	10	.....	Water	10,000	....do	Sheppard & Co.
Dry creek	Dry Creek	1862	10	.....	Steam	10,000	....do	Knox & Co.
El Dorado	El Dorado	1866	10	.....	....do	10,000	....do	William Irvine.
M. F. Mokelumne river	Carlton's Arrastrns	1860	.....	2	Water	200	....do	B. F. Carlton.
Musqueto	Mosqueto Quartz Mining Company	1863	15	.....	Steam	15,000	....do	Cutter & Waters.
San Andreas	Rathgeb's	1864	10	.....	Water	7,000	....do	John Rathgeb.
Do	Taite & McGlynn	1864	8	.....	...do	6,000	....do	Taite & McGlynn.
Do	Tubbs's	1860	10	.....	....do	15,000	....do	Tubbs & Co.
Sandy gulch	Woodhouse	1858	15	.....	....do	3,000	....do	C. Smith.
Skull Flat	Casner's	1859	8	.....	....do	3,000	....do	Casner & Barnes.
West Point	Harris's	1860	5	.....	....do	15,000	....do	A. Harris.
Do	Hope's	1860	15	.....	....do	4,000	....do	—— Hope.
Do	Lacey's	1861	5	.....	....do	4,000	....do	A. Lacey.
Do	Schmidt & Fisher	1864	2	.....	....do	3,000	....do	Schmidt & Fisher.
Do	Vance's	1862	8	.....	Steam	15,000	....do	—— Bernard.
EL DORADO COUNTY.								
Cold Springs	Columbus	1866	.....	.....	Water	.....	Gold	J. C. McTarnahan, superintendent.
Coloma	Isabell Gold and Silver Mining Co	1864	5	.....	....do	6,000	....do	Philo Isabell, superintendent.
Cosumnes	Stillwagon & Norton	1866	4	.....	....do	1,500	....do	Stillwagon & Norton.
Do	Tulloch & Ault	1866	8	.....	Steam	4,000	....do	Tulloch & Ault.
Diamond Springs	Cooke's	1866	5	.....	Water	1,000	Cement	J. Cooke & Co.
El Dorado	Fort Yuma	.....	.....	.....	Steam	.....	Gold	
Do	Logtown	1856	10	.....	....do	9,000	....do	Goldy & Burlingham.

Do	Montezuma	1866	40		Water	60,000	....do	—— Spence, agent.
Do	New York El Dorado	1865	20		Steam	20,000	....do	New York El Dorado Company.
Do	Sugar Loaf	1866	20		....do	15,000	....do	B. Dickerman, superintendent.
Do	Union	1865			....do	12,000	....do	J. T. Babcock, superintendent.
Do	Wilder's	1865	10		Water	2,500	....do	B. W. Wilder.
Georgetown	Clipper Gold and Silver Mining Co.	1863			....do	12,000	....do	R. Cushman, superintendent.
Do	Woodside	1863	2		Steam	6,000	....do	Ash, Lane & Knox.
Georgia Slide	Blue Rock	1866	10		Water	1,000	....do	John Hines & Co.
Grizzly Flat	Eagle	1866	20		....do	12,000	....do	William Bigler.
Lyonsdale	Blue Ledge	1864	2		Steam	60,000	....do	A. M. Stetson, superintendent.
Kelsey	Plymouth	1864	15		Water		....do	—— Potter, superintendent.
Placerville	Harmon	1866	15		Steam	20,000	....do	Harmon Gold and Silver Mining Co.
Do	Loafer's Hollow	1866	10		....do	12,000	....do	C. W. Moulthrop, superintendent.
Do	Manning	1864	4		....do	5,500	....do	Blain, Alderson & Co.
Do	New El Dorado	1863	15		....do		....do	A. Lazeas, superintendent.
Do	New York	1862	20		....do	10,000	....do	F. Reed.
Do	Pacific	1867	10		....do	15,000	....do	J. M. Douglass.
Do	Poverty Point	1864	10		....do	8,000	....do	Burdick & White.
Shingle Springs	Gray's	1863	10		....do	1,500	....do	Gray, Brothers & Son.
Smith's Flat	Brewster & Co	1866	12		Water	6,000	....do	Brewster & Co.
Do	Hook and Ladder	1866	4		....do	500	....do	Anderson & Redd.
Do	Taft's	1860	10		Steam	2,000	....do	P. M. Taft.
Soap Weed	Cobb & Co	1866	12		Water	4,000	....do	Cobb & Co.
Texas Hill	Stewart's	1866	10		....do	3,000	....do	Stewart & Hall.
Volcanoville	French	1859	20		Steam	40,000	....do	French Company.
White Rock	Live Oak	1866	8		Water	2,000	....do	Ward Brothers.
INYO COUNTY.								
Chrysopolis City	Oro Fino	1866	20		Water	35,000	Gold and silver	New York Company.
Coso district	Josephine	1865	5		Steam	30,000	....do	Do.
George's creek	Passmore's	1866	4		Water	2,000	....do	Thomas Passmore.
Inyo district	New York Company	1865	16		Steam	50,000	....do	New York Company, M. Dore, agent
Kearsarge City	Paul's	1866	5		Water	10,000	....do	New York Company.
Kearsarge district	Kearsarge Company	1866	20		Steam	50,000	....do	Kearsarge Company.
Do	Kearsarge	1866	5		Water	15,000	....do	Goldthwaite & Co.

Tabular statement of quartz mills in California, 1866—Continued.

Location of mill.	Name of mill.	When erected.	No. stamps.	No. arrastras.	Power.	Cost.	Gold, silver, or cement.	Occupants in 1866.
Lafayette, Owen's river	Union	1863	8	.....	Steam	$15,000	Gold and silver.	Union Mining Company.
Owen's lake	Owen's River Mill	1864	8	.....	....do	15,000	....do	Owen's River Mining Company.
Owen's river, east side	New York Mining Company	1866	10	2	....do	20,000	....do	New York Mining Company.
San Carlos	Ida	1863	5	.....	....do	10,000	....do	Ida Mining Company.
Do	San Carlos	1863	10	.....	....do	20,000	....do	San Carlos Mining Company.
Slate range	Slate Range	1865	8	.....	....do	28,000	....do	Slate Range Company.
KERN COUNTY.								
Erskine creek	Erskine Creek	1866	.....	4	Water	5,000	Gold	Erskine Creek Company.
Greenhorn	Alpine Gold Mining Company	1866	24	.....	Steam	30,000	....do	W. F. White & Co.
Havilah	Agua Caliente	1865	10	.....	....do	16,000	....do	Wolskill & Co.
Do	Freeman's	1864	4	.....	....do	6,000	....do	New York and Clear Creek Mining Co.
Do	General Grant Gold Mining Co	1865	10	.....	....do	12,000	....do	General Grant Mining Company.
Do	Howe & Oder's	1865	10	.....	....do	16,000	....do	Howe & Co.
Do	Kellum & Wright	1866	10	.....	....do	10,000	....do	Kellum & Wright.
Do	Loyala	1864	10	.....	....do	22,000	....do	H. McKeadney.
Do	Marsh & Kennedy	1866	6	4	Water	17,000	....do	Marsh & Kennedy.
Do	New York and Clear Creek Mining Co.	1866	10	.....	Steam	22,000	....do	New York and Clear Creek Mining Co.
Do	Pioneer	1865	8	.....	....do	9,000	....do	J. H. Thomas.
Do	Rand & Co	1865	10	.....	Steam	16,000	....do	A. A. Rand & Co.
Do	Reed & Lillies	1865	.....	2	Water	6,000	....do	Reed & Lillie.
Do	Union	1865	12	.....	Steam	18,000	....do	J. H. Piper & Co.
Kelsoe cañon	Olanche Gold and Silver Mining Co	1866	.....	.....	.....	.....	.....	Olanche Gold and Silver Mining Co.
Do	Pettus Gold and Silver Mining Co	1865	.....	10	Steam	15,000	....do	Pettus Gold and Silver Mining Co.
Do	Rogers's	1866	5	.....	....do	10,000	....do	R. H. Rogers.
Kernville	Big Blue Gold and Silver Mining Co	1864	12	.....	Water	40,000	....do	Big Blue Gold and Silver Mining Co.
Do	Sumner	1864	8	.....	....do	30,000	....do	Kern River Gold & Silver Mining Co.
Kernville	Mammoth	1866	20	.....	....do	45,000	....do	Mammoth Gold Mining Company.

Do	Roberts & Co	1855	4	1	....do	9,000	....do	G. D. Roberts & Co.
Posa Flat	Long Tom	1865	10		Steam	22,000	....do	Do.
Walker's basin	Joe Walker Mining Company	1866	20		....do	25,000	....do	Joe Walker Mining Company.
KLAMATH COUNTY.								
Black Bear gulch	Black Bear		12				Gold	Daggett, Coughlin & Co.
Eddy's gulch	Live Yankee		8				....do	William Coddington.
Do	Union		8				....do	Henry Swain.
MARIPOSA COUNTY.								
Agua Frio creek	Mullen & Co	1857	4		Water	2,000	Gold	Mullen & Co.
Bear creek	J. Boffio	1865	4	2	....do		....do	Juan Boffio.
Do	G. Chittenden	1864	8		....do		....do	George Chittenden.
Bear valley	Bear Valley	1855	10	2	Steam		....do	Mariposa Company.
Bondurant	Hesleps	1866	10		....do		....do	Heslep & Co.
Do	Shimer & Co	1863	10		....do		....do	Shimer & Co.
Bridgeport	Washburn's	1865	15	1	....do		....do	Washburn & Co.
Buffalo gulch	Feliciana Vein	1865	5	3	....do		....do	L. Trabucco.
Bull creek	Black & Munn's	1860	4	2	Water		....do	Black & Munn.
Chimesal	Floyd's	1861	10		Steam		....do	J. D. Wilson.
Coulterville	Johnson's	1859	24		....do		....do	J. F. Johnson.
Gentry's gulch	Coward's	1860	10	2	....do	25,000	....do	H. G. Coward.
Hite's cove	Hite's	1863	8	4	Water	22,000	....do	J. Hite and Wynants.
Hornito's	Hornitos Gold and Silver Mining Co	1860	20		Steam	30,000	....do	Hornitos Gold and Silver Mining Co.
Mariposa	Francis	1856	10	2	Water	4,000	....do	Charles Francis.
Do	Mariposa	1864	50		Steam	82,000	....do	Mariposa Company.
Maxwell creek	Maxwell Gold and Silver Mining Co	1864	40		....do	60,000	....do	Maxwell Gold and Silver Mining Co.
Merced river	Benton Mills	1858	64		Water	120,000	....do	Mariposa.
Do	Ferguson's	1861	8	2	....do	6,000	....do	E. Ferguson.
Do	Miller & Co	1862	6		....do	5,000	....do	Miller & Jenkins.
Do	Peck, Fountain & Co	1862	6		....do	5,000	....do	Peck, Fountain & Co.
Do	Rutherford Brothers	1860	8	2	....do	12,000	....do	James Tannerhill.
Mount Gaines	Mount Gaines	1862	10	2	Steam	13,000	....do	Felix Deville.
Mount Ophir	Mount Ophir	1858	24		....do	95,000	....do	Mariposa Company.
North fork Merced river	Clark, Derrick & Co	1857	10		....do	7,000	....do	W. W. Kelton.
Do	Goodman & Co	1856	8	2	Water	4,000	....do	Goodman & Co.

Tabular statement of quartz mills in California, 1866—Continued.

Location of mill.	Name of mill.	When erected.	No. stamps.	No. arrastras.	Power.	Cost.	Gold, silver, or cement.	Occupants in 1866.
Princeton	Princeton	1860	24	3	Steam	$40,000	Gold	Mariposa Company.
Sherlock's creek	Cashman & Co	1863	15		do	20,000	do	Cashman & Co.
Sweetwater	Ellis	1861	10	2	do	6,000	do	Samuel Ellis.
Do	Rollins & Co	1863	12		do	8,000	do	Rollins & Co.
Split Rock	Crown Lead Company	1863	40		do	20,000	do	Crown Lead Company.
Stockton creek	Mariposa	1858	8	2	Water	6,000	do	Mariposa Company.
Temperance creek	Barrett's	1860	4		Steam	5,000	do	Joseph Barrett.
Do	Lafayette Mining Company	1866	4		do	5,000	do	Lafayette Mining Company.
White's Flat	Daniel Breen & Co	1865	4	1	do	1,500	do	Daniel Breen & Co.
Whitlock's	Whitlock Gold and Silver Mining Co.	1863	12	2	Water	22,000	do	Whitlock Gold and Silver Mining Co.
MONO COUNTY.								
Bodie	Empire		16		Steam	130,000	Silver	Empire Mine and Mineral Company.
Do	Homestake		12		do		do	Homestake Mine and Mineral Co.
Hot springs	Williams & Wickland		4		Water	2,500	do	Williams & Wickland.
NEVADA COUNTY.								
Bloomfield	Eureka Mining and Mineral Co		5	2			Gold	Eureka Mine and Mineral Company.
Cisco	Enterprise	1865		4	Steam		do	Frank Maxon, superintendent.
French corral	American Mining Company	1865			Water	30,000	do	J. S. Crall, superintendent.
Do	do	1866	4		do	7,000	Cement	Do.
Do	Empire	1865	10		do	7,000	do	B. Vilain, agent.
Grass valley	Allison's Ranch	1856	12		Steam		Gold	Stanton & Co.
Do	Alta Hill	1862	8		do	22,000	do	J. Jeffree, superintendent.
Do	Byers's	1865	4		Water		do	John Byers.
Do	Cambridge	1866	10		Steam	30,000	do	Cronise, Bulkley & Co.
Do	Eureka Mining Company	1864	20		do	20,000	do	William Watt, superintendent.
Do	Forest Spring	1857	10		Water		do	J. H. Bayliss, superintendent.

Do	Gold Hill	1853	20	Steam	20,000	do	J. K. Edwards, superintendent.
Do	Harterey	1866	8	do	20,000	do	J. S. Lambert, superintendent.
Do	Ione Mining Company	1865	10	do		do	S. T. Curtis, superintendent.
Do	Lady Franklin	1856	8	do	10,000	do	J. R. Rush.
Do	Laramie's		8	Water	8,000	do	John Laramie.
Do	Laton's	1864	8	2 Steam	8,000	do	W. R. Taylor, superintendent.
Do	Lucky Mining Company	1866	15	do		do	Do.
Do	Merrimac	1864	10	do	13,000	do	H. Scadden, superintendent.
Do	Metallurgical Works	1862		do	3,000	do	William Hill.
Do	New Orleans	1863	8	2 do	15,000	do	John Smith, superintendent.
Do	North Star	1854	16	do	40,000	do	W. H. Bordels, superintendent.
Do	Ophir, New	1866	30	do	125,000	do	Empire Mining Company.
Do	Ophir, Old	1856	6	do	20,000	do	Do.
Do	Pacific Ore Company	1866	5	do		do	W. A. Williams, agent.
Do	Rocky Bar	1854	16	2 do	30,000	do	A. B. Brady, superintendent.
Do	Sebastopol	1863	12	4 do	20,000	do	Watt & Co.
Do	Town Talk	1864	8	do	10,000	do	J. Jeffree, superintendent.
Do	Union Hill	1866	20	do	20,000	do	Findley & Co.
Do	Wolf Creek	1863	5	Water	6,000	do	Joseph Perrin.
Do	Woodworth & Co	1865	15	Steam	30,000	do	Daniel McGrath, superintendent.
Hunt's Hill	Clay & Co	1866	8	Water	5,000	Cement	C. C. Going, superintendent.
Do	Eastern	1866	8	do	3,000	do	John Knox, superintendent.
Do	Gouge Eye	1866	8	do	3,000	do	Fuller, Goodspeed & Co.
Little York	Curran & Buckman's	1864	8	do	8,000	do	Curran & Buckman.
Do	Jenny Lind		8	do	3,000	do	F. Larkin.
Do	Remington & Pond's	1865	10	do	9,000	do	Remington & Pond.
Meadow lake	California Con. Mining & Mineral Co.	1865	8	Steam	17,000	Gold	J. K. Stewart, superintendent.
Do	Excelsior Mining and Mineral Co	1866	20	do	75,000	do	James S. Harrison, superintendent.
Do	Grant Mining Company	1865	5	do	15,000	do	J. E. Squires, superintendent.
Do	Winton	1865	10	do	22,000	do	N. W. Winton & Co.
Nevada township	Banner	1866	10	do	15,000	do	George W. Kidd, superintendent.
Do	Cornish	1859	6	2 Water	8,000	do	Phil. Richards, superintendent.
Do	Empire	1866	10	do	4,000	Cement	Jacobs & Sargent.
Do	Federal Loan		2	Steam		Gold	J. Hecker, superintendent.
Do	Forest Hill	1861	5	do	8,000	do	E. Dunscombe, superintendent.

Tabular statement of quartz mills in California, 1866—Continued.

Location of mill.	Name of mill.	When erected.	No. stamps.	No. arrastras.	Power.	Cost.	Gold, silver, or cement.	Occupants in 1866.
Nevada township	French	1861	6	.....	Steam and water	$24,000	Gold	L. Charonnat, superintendent.
Do	Gold Tunnel	.....	6	.....	Steam	.....	....do	G. W. Kidd, superintendent.
Do	Green Mountain	1866	10	.....	Water	7,000	Cement	Jacobs, Sargent & Co.
Do	Manzanita	.....	15	.....	Steam	.....	Gold	W. Maltman, superintendent.
Do	Murchie's	1863	8	.....	Water	5,000	....do	Murchie Brothers.
Do	Nevada Quartz Mining Company	1861	12	.....	....do	25,000	....do	William Rateliff, superintendent.
Do	Oriental	1854	8	.....	Steam	10,000	....do	F. A. Miller, superintendent.
Do	Oro Fine	1860	6	.....	Water	3,500	....do	Brown, Hinds & Co.
Do	Palmer's	1863	4	.....	Steam	8,000	....do	O. Palmer.
Do	Pennsylvania	1864	8	.....	....do	9,000	....do	J. H. Helm, superintendent.
Do	Province Gold and Silver Mining Co.	1864	12	.....	....do	20,000	....do	Thos. F. Dingley, superintendent.
Do	Sneath & Clay's	1863	12	.....	....do	65,000	....do	E. Dunscombe, superintendent.
Do	Stiles	1861	8	.....	Water	5,000	....do	W. C. Stiles.
Do	Wigham	.....	20	.....	Steam	.....	....do	S. D. Merchant.
Red Dog	Carney & Jackson	1866	8	.....	Water	3,000	Cement	A. Tucker, superintendent.
Do	Weir & Garber's	1861	6	.....	....do	2,500	....do	James Weir.
Do	Williams, Riggs & Co	1864	12	.....	Steam	15,000	....do	T. Riggs, superintendent.
Do	Wright & Co	1865	10	.....	Water	5,000	....do	Frank Ennis, superintendent.
Washington township	Brandy Flat Mining Company	.....	4	.....	....do	.....	Gold	N. Knowlton, superintendent.
Do	Marietta Mining Company	.....	5	.....	....do	.....	....do	Captain Lindsey, superintendent.
Do	Milton Willis Mining Company	.....	4	.....	....do	.....	....do	S. D. Woolsey, superintendent.
Do	Star Quartz Mining Company	1863	8	.....	Steam	15,000	....do	Edward Withington, agent.
Do	Tecumseh Mining Company	1864	8	.....	Water	16,000	....do	John Patterson, superintendent.
You Bet	Brown Brothers & Co	1864	8	.....	....do	6,500	Cement	H. K. Brown, agent.
Do	Cozzens & Garber's	1865	10	.....	Steam	15,000	....do	Cozzens & Garbers.
Do	Heydlauff's	1865	10	.....	Water	5,000	....do	W. F. Heydlauff, superintendent.
Do	Mallory & Co	1866	8	.....	....do	4,500	....do	S. Stelting, agent.

Do	Neece & West	1865	10		do	6,000	do	A. Neece, agent.
Do	Union	1865	10		do	7,000	do	Collins & Sons.
PLACER COUNTY.								
Auburn	Millett's	1866	5		Steam	3,000	Gold	—— Millett.
Bath	Paragon	1863	20		do	15,000	Cement	J. Wheeler, agent.
Do	Rough Gold Company's	1865	10		do	12,000	do	William Davis, agent.
Colfax	Live Oak	1862			Water	4,000	Gold	John McKinney, agent.
Damascus	Pioneer	1855			Steam	12,000	do	Colman & Co.
Devil's cañon	Missouri Company	1866	10		do	12,000	Cement	A. Moore & Co.
Dutch Flat	McCullough	1866	5		do	5,000	Gold	McCullough Mining Company.
Forest Hill	Baltimore	1866	10		do	7,000	Cement	William Northwood.
Do	Big Spring Company	1866	10		do	10,000	do	J. P. Cartner & Co.
Do	Hope Company	1866	20		do	15,000	do	George W. Reamer.
Do	Oro Company	1866	20		do	12,000	do	George W. Reamer, agent.
Gold Run	Indiana Hill	1865	10		Water	8,000	do	A. H. Mallory, agent.
Harpending mine	Banker	1865	5		Steam	5,000	Gold	Harpending Mining Company.
Do	San Francisco Company	1866	40		do		do	Do.
Iowa Hill	Morning Star	1865	10		do	10,000	Cement	James Dods & Co.
Newcastle	Schnabel's	1865	5		Water	2,000	Gold	—— Schnabel.
Ophirville	Pugh's	1863	5		do	2,000	do	C. D. Pugh & Co.
Do	Welty's	1865	10		Steam	6,000	do	Welty & Co.
Sanders's ranch	Sander's Ranch Mill	1866	10		do		do	
Secret cañon	Secret Spring	1864	6		do	10,000	do	Grant & Co.
Stewart's Flat	Stewart's Flat	1864	5		do	3,000	do	J. Rogers.
Whiskey diggings		1866	10		do	6,000	do	
Do	Baker & Crosby	1866	40		do	50,000	do	Peachy, Hoffman & Co.
Wisconsin Hill	Oriental	1866	20		do	25,000	do	Conklin, Hosmer & Co.
Do	Arnold, Lee & Co	1866	10		do		Cement	Arnold, Lee & Co.
PLUMAS COUNTY.								
Argentina	Sherman, Root & Co	1864		3	Water	1,500	Gold	Sherman, Root & Co.
Butte bar	Butte Bar Company	1864	4		do	1,500	do	Butte Bar Company.
Dixie	Abbott's	1863		2	do	1,500	do	H. B. Abbott.
Do	Compton's	1863	6		do	6,000	do	J. D. Compton.
Do	Dixie	1863	8		do	7,000	do	H. C. Bidwell.

Tabular statement of quartz mills in California, 1866—Continued.

Location of mill.	Name of mill.	When erected.	No. stamps.	No. arrastras.	Power.	Cost.	Gold, silver, or cement.	Occupants in 1866.
Dixie	Wiles	1863	6	.....	Water	$5,000	Gold	Wiles & Brother.
Eureka lake	Eureka	1852	30	3	Steam and water.	100,000	....do	John Parrott.
Franklin Hill	Franklin Hill Company	1860	6	.....	Water	2,000	....do	Franklin Hill Company.
Genessee valley	Ward & Co	1862	.....	.....	....do	1,500	....do	Ward & Co.
Greenville	Greenville	1862	6	.....	....do	6,000	....do	H. E. Bidwell.
Do	Lone Star	1862	8	.....	....do	7,000	....do	Bidwell & Aschin.
Indian valley	Crescent	1862	24	.....	Steam	25,000	....do	W. A. Bollinger & Co.
Do	....do	1866	32	.....	....do	60,000	....do	Do.
Do	Indian Valley	1863	20	.....	....do	20,000	....do	J. N. Blood & Co.
Do	Pennsylvania	1863	16	.....	....do	20,000	....do	Trucks & Waterworth.
Jamison creek	Mammoth	1851	12	2	Water	20,000	....do	McGee & Thompson.
Do	'76 Company	1852	.....	3	....do	3,000	....do	Elwell, Nave & Co.
Mohawk valley	King & Co	1866	4	.....	....do	2,000	....do	King & Co.
Round valley	Golden Gate	1862	16	2	Steam	20,000	....do	Howell & Haynes.
Rush creek	Berg Mill	1863	8	.....	....do	15,000	....do	Holthouse, Miller & Co.
SAN BERNADINO COUNTY.								
Holcomb valley	Mellus	1860	4	4	Steam	20,000	Gold	A. Wade.
Maronga	Nichols	1864	.....	.....	....do	10,000	Silver	Maronga Mining Company.
Mojave	Green Lode	1863	.....	.....	....do	25,000	Gold and silver.	George E. Moore.
SHASTA COUNTY.								
Copper City	Peck's	1864	8	.....	Water	6,000	Gold	—— Peck.
French gulch	Highland	1863	10	.....	Steam	10,000	....do	Thomas Purnell, superintendent
Do	Honeycomb	1865	8	2	Water	6,000	....do	S. Grover.
Do	Washington	1851	10	.....	....do	10,000	....do	J. Syms, superintendent.
Lower springs	George's	1866	.....	.....	Steam	1,500	....do	W. H. George.
Do	Union	1866	4	.....	....do	6,000	....do	H. Jones.

Muletown	Kanaka	1866	4		Water	3,000	....do	—— Kelly.
Do	Potosi	1865	4		....do	8,000	....do	—— Catron.
Old diggings	Mammoth	1864	8		Steam	20,000	....do	I. Isaacs.
SIERRA COUNTY.								
Alleghanytown	Eagle	1866	10		Steam	12,000	Gold	Eagle Quartz Mining Company.
Do	21 Quartz Mining Company	1865	4		Water	4,500	....do	21 Quartz Mining Company.
American Hill	American Hill	1858	6		Steam and water	8,500	....do	Young & Co.
Chipps	Rainbow	1857	8		Steam	8,500	....do	P. A. Lamping.
Divide	Charcoal Company	1858			Water	8,300	....do	Beauchamp & Langton.
Do	Keystone Quartz Mining Company	1858	12		Steam	12,500	....do	Keystone Quartz Mining Company.
Downieville	Gold Bluff	1858	12	1	Water	14,100	....do	Stumpf & Co.
Do	Montpelier Company	1858		1	....do	7,000	....do	Montpelier Quartz Mining Company.
Do	Oro Company	1860		2	....do	6,000	....do	P. A. Lamping.
Do	Slug Cañon	1859		1	....do	7,100	....do	Blackstone Quartz Mining Company.
Gold lake	Havens & Co	1860			....do	5,150	....do	Havens & Lemprich.
Gold valley	Gold Valley	1858	10		....do	16,200	....do	Herrick & Grey.
Hog cañon	Primrose Company	1858	12		Steam	15,400	....do	Primrose Mining Company.
Jim Crow cañon	Ironsides	1864			Steam and water	10,000	....do	Ironsides Quartz Mining Company.
Do	Plumbago	1862		1	Water	2,000	....do	Hoadley & Co.
Do	Sierra Consolidated	1863	12		Steam	60,000	....do	Sierra Con. Quartz Mining Company.
Kanaka creek	Oak Flat Company	1863	4		Water	4,500	....do	Oak Flat Quartz Mining Company.
Kanaka ravine	Kanaka Quartz Mining Company	1865	20		....do	22,500	....do	Kanaka Quartz Mining Company.
Middle Yuba river	French	1865	5		....do	4,000	....do	French Company.
Minnesota	Briggs & Co	1863	5		Steam	6,500	....do	Briggs & Co.
Do	California	1855	4		Water	4,000	....do	Wright & Bowen.
Mountain house	Mountain House	1858	4		Steam	5,350	....do	Watson & Co.
Sierra buttes	Bigelow Company	1858	4	2	....do	6,000	....do	Bigelow & Moore.
Do	Independence	1858	36	2	Water	36,000	....do	Independence Mining Company.
Do	Kane & Co	1865		1	....do	1,000	....do	Kane & Co.
Do	Mexican Company	1858		2	....do	1,000	....do	Maldonado & Co.
Do	Sierra Buttes Company	1852	24	4	....do	30,000	....do	Sierra Buttes Company.
Web ravine	Union	1860	8		....do	8,600	....do	Union Quartz Mining Compnay.
Web ravine, M. F	Four Hills	1862	4		....do	5,300	....do	Spencer & Grey.
Web ravine, S. F	Chipps	1858	4	1	....do	4,200	....do	English & Higgins.
Web ravine, S. F	Kentucky	1856		1	....do	5,000	....do	—— McKenzie.

Tabular statement of quartz mills in California, 1866—Continued.

Location of mill.	Name of mill.	When erected.	No. stamps.	No. arrastras.	Power.	Cost.	Gold, silver, or cement.	Occupants in 1866.
SISKIYOU COUNTY.								
Humbug creek	Lash & Co	1862	8	1	Steam	$6,000	Gold	Lash & Co.
Indian creek	London	1859	8	.....	....do	10,000	....do	London Quartz Mining Company.
Do	Siskiyou	1859	8	.....	....do	8,000	....do	
Quartz valley	Turk's	1857	4	1	Water	5,000	....do	F. Turk.
Siskiyou	Sleeper Mill	1863	8	.....	Steam	5,000	....do	Sleeper & Co.
TULARE COUNTY.								
White river	Carter's	1866	8	.....	Steam	20,000	Gold	J. Carter.
Do	Houston	1862	8	2	Water	8,000	....do	J. C. Birdseye.
Do	Hudnut	1866	.....	.....	....do	3,000	....do	Hudnut & Co.
Do	Josephine	1861	5	1	....do	5,000	....do	J. C. Birdseye.
TUOLUMNE COUNTY.								
American camp	Jones & Woodman	1864	10	1	Steam and water	10,000	Gold	Jones & Woodman.
Bald mountain	Sophia	1865	5	.....	Water	5,000	....do	Josephi & Co.
Blue gulch	Eagle	1865	10	.....	....do	10,000	....do	Eagle Mining Company.
Cherokee	Larco	1858	10	2	....do	3,000	....do	C. Lombardo.
Do	Magee	1859	8	.....	Steam	7,000	....do	Platt Brothers.
Calder's ranch	Comstock	1864	10	.....	....do	8,000	....do	Comstock & Fry.
Confidence district	Confidence	1858	10	3	....do	10,000	....do	T. Toulsly.
Do	Independence	1868	10	2	....do	10,000	....do	A. P. Brayton.
Deer creek	Deer Creek	1865	5	.....	....do	8,000	....do	Deer Creek Company.
Five-mile creek	Hazel Dell	1864	5	.....	Water	4,000	....do	Phelps & Co.
Do	Ryerson's	1865	.....	.....	Steam	10,000	....do	M. Brumagin.
Jackass Hill	Walters's	1859	5	.....	Water	5,000	....do	Walters & Co.
North fork Tuolumne river	Big Cañon	1858	10	.....	....do	15,000	....do	Cobb & Sinton.
Do	Bonita	1866	10	.....	....do	10,000	....do	Bonita Company.

Do	Consuelo	1866	27		do	20,000	do	Consuelo Company.
Do	Grizzly	1859	20		do	20,000	do	Gashwiler & Co.
Do	Starr King	1866	5		Steam	7,000	do	R. Inch & Co.
Poverty Hill	Golden Rule	1865	20		do	15,000	do	Golden Rule Company.
Do	Heslep's	1860	10		do	10,000	do	Heslep & Co.
Rawhide ranch	Rawhide Ranch	1866	20		do	45,000	do	R. P. Johnson, agent.
Soulsbyv lle	Gilson's	1859	10	1	do	8,000	do	Gilson & Hampton.
Do	Soulsby	1858	20		do	20,000	do	D. Davidson & Co.
Sonora	Sonora	1866	15		Water	15,000	do	Sonora Gold Company.
Sugar pine	Daegner	1864	10		Steam	10,000	do	William Daegner.
Do	Eureka	1859	20		Water	20,000	do	—— Edwards, agent.
Do	Excelsior	1860	10	1	do	10,000	do	Wright & Gilmore.
Do	Green's		5		Steam		do	—— Green.
Do	Lombardo	1860	8		Water	10,000	do	C. Lombardo.
Do	Monitor	1863	5	1	do	10,000	do	Monitor Gold and Silver Mining Co.
Do	Pirate	1860	8		do	10,000	do	C. Dorsey.
Summerville	Summers	1860	8		do	8,000	do	G. Summers.
Summit pass	California Gold and Silver Mining Co.	1864	15	1	do	20,000	do	Goddard & Co.
Stanislaus river	Telegraph	1860	20		do	20,000	do	D. Davidson & Co.
Tuolumne river	Buchanan	1859	10		do	10,000	do	Tuolumne Gold Mining Company.
Turnback creek	Laurel Hill	1857	0	2	do	3,060	do	San Francisco Company.
Tuttletown	Patterson's	1857	10		do	10,000	do	W. Patterson.
Do	Valparaiso	1858	10		do	6,000	do	Valparaiso Company.
Whiskey Hill	Preston's	1860	10		do	4,500	do	Rosecrans & Co.
Do	Reist's	1860	4		do	2,000	do	C. Reist.
Whitman's pass	Whitman's	1866	5		do	5,000	do	Milner & Co.
Wood's crossing	App's	1860	10		Steam and water	10,000	do	John App & Co.
Do	Clem & Co	1859			Water	8,000	do	Clem & Co.
Do	Duncan's	1859			do	3,000	do	J. Duncan.
Yankee Hill	Shanghai	1862	10		do	10,000	do	Gashwiler & Hooper.
Yorktown	Mrs. Hill's	1859			do	4,000	do	Mrs. L. Hill.
YUBA COUNTY.								
Brown's valley	Danebroge	1859	8		Water	20,000	Gold	Danebroge Mining Company.
Do	Jefferson	1862	12		do	40,000	do	Jefferson Mining Company.

Tabular statement of quartz mills in California, 1866—Continued.

Location of mill.	Name of mill.	When erected.	No. stamps.	No. arrastras.	Power.	Cost.	Gold, silver, or cement.	Occupants in 1866.
Brown's valley	Pennsylvania	1862	16	.....	....do.....	$40,000	....do.....	Pennsylvania Mining Company.
Do	Sweet Vengeance	1865	20	.....	....do.....	50,000	....do.....	Sweet Vengeance Mining Company.
Eagleville	.....	1865	8	.....	....do.....	15,000	....do.....	Incorporated.
Indian ranch	Temple No. 2	1866	8	.....	....do.....	30,000	....do.....	Do.
Middle Yuba	Mount Hope	1865	4	.....	....do.....	10,000	....do.....	Mount Hope Mining Company.
Smartsville	Andrew Jackson	1866	10	.....	....do.....	12,000	....do.....	Andrew Jackson Mining Company.

OREGON.

Gold placers have been worked in Jackson county, in the southern part of Oregon, since 1850, and the production has been estimated at $1,000,000 annually. The Secretary of State reports the yield of gold for 1864 as 106,226 ounces, valued at $1,900,000. The gold-washings of John Day river are reputed to have yielded $1,500,000 in 1866. The total production of the State for 1867 is stated to be $2,000,000 by some and $4,000,000 by others. These are partly estimates, and it is not possible to obtain exact and complete returns. I have adopted the estimate of $2,000,000 as probably nearest the truth. The shipments of bullion from Portland to San Francisco include the gold and silver from Idaho and a part of Washington Territory. The total amount of treasure manifested in 1866 was $8,726,017; but the sources from whence it came were not specified. There is a great want of authentic information upon the mineral resources of Oregon, which are believed to be very great.

In the Santiam district some promising veins have been opened and some very rich quartz extracted; but, for unexplained reasons, the mines are neglected and no returns of bullion have been made.

The following notices of these districts are condensed from a description furnished to the writer in 1866 by Mr. Foley:

Gold Creek district, North Santiam.—"The North Fork of the Santiam flows from the base of Mt. Jefferson (on the north side) west-southwest, through the western slope of the Cascade mountains, until it debouches in the main Santiam, 40 miles from its source. Gold creek heads on the south side of Web-foot mountain, (which divides the head-waters of Clackamas, Molalla, and Gold creek,) flows southwest 12 miles, and empties in the North Fork.

"Gold Creek district was organized on the 29th day of August, 1865. Its boundary is the area of country drained by the tributaries of Gold creek. Through the centre of this district runs north and south a backbone or mountain ridge, known as Web-foot ridge, having an altitude of 3,000 feet above the sea, which inclines or sloped to the east and west, at an angle of 35 degrees to the plane of the horizon, and is not more than 5,000 feet wide at its base, east and west. Twenty well-defined quartz lodes, already discovered, cross this ridge. Their general course is 25 degrees west or north, dip to the east-northeast from 20 to 35 degrees, and contain gold and silver. They are parallel and about 50 yards apart.

"Of these may be mentioned the Gibbs, Tracey, Jefferson, Moore, and Chapman lodes. The following named companies were organized for working in this district: Aurora, 7,200 feet; Oregon City, 10,000 feet; Laurel, 30,000 feet; Phœnix, 4,800 feet; Morning Star, 12,000 feet. The Aurora company has a tunnel 80 feet in length, from which has been taken about 150 tons of ore; the Oregon City, one of 40 feet, from which 70 tons has been taken; the Phœnix, a shaft 45 feet in depth. There is as yet no machinery in this district. Wood is abundant.

"South Santiam, or Santiam proper, is situated on the South Fork of

the Santiam. This stream flows from the south side of Mt. Jefferson. Some 30 quartz lodes are discovered in this camp, and they are similar to those of North Santiam, with the exception that they contain more copper ore. South and North Santiam are 40 miles apart as the quartz lodes run."

The number of stamp mills in the State in 1866 was 14, with an aggregate of 67 stamps and 17 arrastras.

Gold quartz mills in Oregon in 1866.

Location.	Name of mill.	When erected.	Number stamps.	Number arrastras.	Power.	Cost.	Occupants in 1866.
Baker county							
Baker City	Ruckles		20				J. S. Ruckles.
Grant county							
Prairie Diggings	Aldred & Co's			1	Water		Aldred & Co.
Vincent creek	Crowcher's		3		Water		Crowcher & Co.
Jackson county							
Applegate	Steamboat	1860	4	3	Water	$8,000	Fowler & Co.
Dardanelles	Occidental	1866	10	2	Steam	1,200	Hogan & Co.
Jackson creek	Hopkins	1860	5	1	Steam	8,000	Hopkins & Co.
Do	Johnson's	1862		2	Water	4,000	Johnson & Co.
Rogue river	Jewett's	1861	5		Steam	10,000	Byba & Co.
Sterling	Ives	1865		1	Horse	500	Porter Ives.
Thompson creek	Thompson Creek	1865		4	Water	1,500	Morris & Co.
Josephine county							
Enterprise	Enterprise	1865	10	2	Water	18,000	—— Cohen.
Union county							
Eagle creek	Eagle						Meacham Bros. & Co.
Hoquim	Carter & Davis	1865	5	1	Water	8,000	Carter & Davis.
Kooster	La Grande	1866	5			8,000	La Grande Co.

IDAHO AND WASHINGTON TERRITORIES.

Gold discoveries were first made in Washington Territory, on the eastern slope of the Cascade mountains, in 1858. The gold region was traced by miners along the Upper Columbia and its tributaries, and in 1860 the first gold discoveries were made in the Nez Percés mines, on the western slope of the Bitter Root mountains. The metal was also discovered upon the following streams: Salmon, John Day's, Powder, Grande Ronde, Burnt, Boise, Payette, Clearwater; all of them on the western slope of the Bitter Root mountains.[1] On the eastern slope Lieutenant Mullan and his party had found gold in 1853, but not in sufficient quantities to pay for working.

These mines are now within the limits of the Territory of Idaho, and the placers upon the Boise are considered the most important. Numerous valuable quartz mines have been opened, and in 1866 there were 32 quartz mills in the Territory, with an aggregate of 357 stamps, erected at a cost of nearly $1,500,000. It is estimated that the yield from the quartz mines amounted, in 1866, to $4,500,000, and from the placers, $1,265,000. In 1867, the yield, including silver, is reported as $6,500,000.

[1] See Mullan's Miners' and Travellers' Guide, p. 76.

These are the figures adopted by Commissioner Browne in his report for 1867, but intelligent residents of Idaho consider that this reported yield of gold and silver bullion is far too low, and estimate it as high as from $18,000,000 to $20,000,000, believing that large amounts are taken out of the Territory by miners without being manifested. The Hon. E. D. Holbrook, delegate of the Territory to Congress, estimates the total production as $20,000,000; gold bullion $16,500,000, and silver bullion $3,500,000. I cannot avoid the conclusion that these estimates are too high, and in the final tables of this report I have adopted the estimate of $6,500,000—gold $5,000,000 and silver $1,500,000—as the probable value of the production for 1867.

The following is an estimate of the total bullion production of Idaho for four years, to 1868:[1]

	1864.	1865.	1866.	1867.
Shipments	$6, 223, 000	$5, 814, 000	$5, 443, 000	$4, 842, 036
Add 10 per cent., the amount estimated to be shipped by other parties, and 10 per cent., the probable amount carried by private hands	1, 244, 600	1, 162, 800	1, 086, 600	968, 406
	$7, 467, 600	$6, 976, 800	$6, 529, 600	$5, 810, 442
Deduct for Oregon and Washington, one-fifth	1, 493, 520	1, 395, 360	1, 305, 920	1, 162, 088
	$5, 974, 080	$5, 581, 440	$5, 223, 680	$4, 648, 354
Add for amounts probably taken out of Idaho by express, through Nevada and by private hands	500, 000	1, 000, 000	2, 800, 000	1, 352, 000
Total	$6, 474, 080	$6, 581, 440	$8, 023, 680	$6, 000, 354

The gold of Idaho contains more silver than that of California, and averages about seven hundred and sixty thousandths, (.760.) There are gold washings in almost all parts of the Territory, even in the silver districts of Owyhee county, near the silver veins, where the gold bullion is worth about $9 per ounce. The Boise dust is worth from $15 to $18, and in some places as much as $19 per ounce. The gold of Florence is worth about $12 per ounce.

The celebrated Poorman lode is in the southern part of the Territory, and produces some gold, but this lode is noticed under the head of Silver.

The gold production of Washington Territory is reported to be $1,000,000, but is estimated by the surveyor general at $1,500,000.

MONTANA TERRITORY.

This Territory was organized and set off from Idaho in 1864. It includes the eastern slope or face of the Bitter Root mountains, and a part of the Pacific water-shed at the head of Clark's fork of the Columbia. Extensive placers and quartz veins are found in that section, and upon both sides of the Rocky mountain chain, at the sources of the Missouri river. The three principal centres of mining are, Bannock, Virginia, and Helena. Hot Springs, 28 miles northeast of Virginia, Summit, eight

[1] Mineral Resources of the United States, p. 535.

miles south, and Bannock, 75 miles northwest of Virginia, are the principal gold quartz-mining districts.

The number of stamp mills in operation in August, 1866, was 14, with an aggregate of 195 stamps.[1] The following is an estimate of the total production of the mines to 1868, made by James W. Taylor, esq., special commissioner for the collection of statistics upon gold and silver mining east of the Rocky mountains.[2]

1863	$2,000,000	1866	$12,000,000
1864	5,000,000	1867	12,000,000
1865	6,000,000		
Total to 1868			$37,000,000

A very interesting report upon the Mineral Resources of the Territory of Montana has recently been made by Mr. W. L. Keyes, mining engineer.[3] The area of the Territory is given as 146,689.35 square miles. In respect to the production of the precious metals, he observes: "We must premise any estimates by the statement of the peculiar difficulties of arriving at any conclusion susceptible of a demonstration. * * * The proportion of bullion produced by the vein mines has not, as yet, amounted to any considerable percentage of the gross yield, and hence does not call for a separate estimate. Another difficulty in the way of a precise statement of gold product is due to the fact that large quantities of dust can be, and doubtless have been, removed northwardly into the British possessions, of which no record is possible. Again, the distance of land transportation to Fort Benton, the head of navigation on the Missouri, is so trifling that merchants and miners act as their own transportation agents, and hence the precise amount carried away by them can never be ascertained. Montana's bullion account, at least until 1865, was largely credited to Washington, Idaho, or Colorado, and hence the tables, as reported by the United States mints, do not represent her true yield. I am indebted to the United States revenue collector for the following figures which form, in my judgment, a more reliable series of estimates for Montana than have ever been given to the public."

Gold product of Montana.

1862, chiefly from Bannock	$600,000
1863, chiefly from Bannock and Alder gulch	8,000,000
1864, Alder gulch, Bannock and other districts	16,000,000
1865, from near Helena, Confederate gulch, and Blackfoot	18,000,000
1866	17,500,000
1867	12,000,000
Total to 1868	$72,100,000

[1] Pacific Coast Directory.

[2] Reports upon the Mineral Resources of the United States, 1867, p. 329.

[3] "Mineral Resources of the Territory of Montana," in the volume of Reports on the Mineral Resources of the United States, 1868, p. 38.

all portion of bullion from Montana finds its way to the San co mint, $309,843 having been deposited there during 1867.
surveyor general of Montana estimates the yield for 1867 at ,000.

BRITISH COLUMBIA.

gold producing belt of Oregon, Idaho, Montana, and Wash- is prolonged northward into British Columbia, and extends iout its length, following the slopes of the Rocky mountain chain. as first discovered in 1858, upon Fraser river, above New West- , and was traced by the miners to the Quesnelle river, 300 miles where gold is found upon both the south and the north forks, and , in the region known as Cariboo. From Cariboo the miners pen- some 450 miles further north and discovered gold placers upon iver, which flows eastward through the Rocky mountain chain ipties into the Mackenzie river through the Great Slave lake. cers of the Stickeen are still further north, and were discovered

This river empties into the Pacific south of Sitka, near latitude l is navigable for small light-draught steamboats four months ir, for about 150 miles from its mouth. Gold is found in the bars h banks of the river above that point, but no very large quan- been obtained. These placers are about 800 miles from Victoria, ommon with the Peace river, Cariboo, and other remote locali- difficult of access, and can only be worked for a few months in r, owing to the extreme severity of the winters. The channels treams are also very deep, so that it is almost impossible to reach -rock by ordinary mining.

ggregate yield of gold at Cariboo during the summer of 1861, of the principal creeks—Antler, Williams, and Lowhee—mined by to 100 men, was a little less than $1,000,000.

l these placers those in the valley of Fraser's river are the most nt and productive. Considerable gold is also taken from the ay mines, near the southern line, and adjoining Washington Ter-

hipments of gold from Victoria to San Francisco, from 1858 to clusive, were as follows:

.....	$337,765	1864	$2,784,226
.....	1,211,304	1685	2,067,661
.....	1,652,621	1866	1,625,311
.....	1,942,629	1867	1,100,588
.....	2,167,183		
.....	2,935,172	Total.....	$17,824,460

hipments from July 1, 1865, to June 30, 1866, by the Bank of Columbia and the Bank of British North America, were $2,054,205, should be added the product of the Kootenay region and the

bullion taken away by private hands. This would probably extend the amount to nearly $3,500,000.[1] The product for 1867 was probably not over $2,000,000.

NEVADA.

Nevada, although pre-eminently a silver producing State, has many districts containing promising auriferous veins, and about one-third in value of the production of the Comstock vein is in gold. Placer deposits were formerly worked in Gold cañon and American ravine, and are found in many of the small ravines west of Washoe valley, but the amount of gold produced from these sources is comparatively insignificant. Quartz veins bearing free gold are found in the Star mountain range, Humboldt, and in the first range east of it, in the region of Dunglen. They are found also in the region of East Walker river. The bullion produced at the mines near Aurora, Esmeralda county, is rich in gold, and at Bodie Bluff, in the vicinity, but within the limits of the State of California, there are many gold-bearing veins and placer deposits, which were formerly worked with considerable success. Still further south and east there is a gold-bearing region of veins and placers in the White mountain range, partly in California, which as yet has been but little explored.

In the Red Mountain or Silver Peak district, west and south of the White mountains, known for the large deposits of rich silver ores, there are also some enormous veins of quartz, bearing free gold, which is abundantly disseminated in small brilliant points, and gives promise of large and profitable returns when the veins are properly worked. A mill of 10 stamps has been erected near the vein, but no details of production have been given.

At Egan cañon, or Gold cañon district, 165 miles east of Austin, auriferous quartz veins are found, and a small mill was erected in 1864 which had great success, and a larger mill is to be constructed.

Gold is also reported to exist in some of the veins in the Santa Fé district, 18 miles from Austin; in the copper ores of Ravenswood district; and abundantly in veins in the New Pass district, about 25 miles west of Austin.

Some very coarse gold occurs in veins, with rich argentiferous copper glance, in Pahdet district, in the region of the White mountains.—(Specimen No. 63 of the California collection.)

In Desert district, along and near the route from the Truckee river to the Humboldt, there are some promising gold-bearing veins, which have hardly been opened owing to the scarcity of water and distance from supplies. These veins are about 70 miles east of Virginia City.

The gold product of Nevada for 1867, including the gold in the bullion from the Comstock lode, may be estimated at $6,000,000.

[1] Pacific Coast Business Directory p. 157.

ARIZONA.

Gold localities appear to be very generally distributed over the Territory of Arizona, but Indian difficulties have greatly retarded explorations and the development of even the best known districts. The principal gold-mining centres are Wickenberg, Prescott, La Paz, Fort Mohave, and Gila City, upon the Gila river.

In the vicinity of the last-named place, and along the Colorado river, there are placer deposits of gold, which have been prospected and are known to be rich, but have never been profitably worked on account of the absence of water. Placers have also been worked upon Weaver's and Lynx creeks, in the interior.

The principal vein-mining region is within a circuit of 30 miles of Prescott, the capital. The veins are most numerous upon Lynx creek, east of Prescott, and among them may be named the Accidental, with a 2-stamp mill; the Eureka, the Eugenie, and Big Bug, the Ticonderoga, and the Green Tree, the four last upon what is known as Big Bug creek.

Vulture mine.—The Vulture lode, 15 miles east of Wickenberg, is now the principal mine of the Territory, and is energetically worked by a New York company. It was discovered in 1863 by Henry Wickenberg, who was enabled to open and prospect the lode by the proceeds of the rich rock taken out of it and worked in arrastras. The selected rock thus treated is said to have averaged $100 a ton for two years. The company which now owns the property has erected a 20-stamp steam mill, at a cost of $75,000, and expended $25,000 more in permanent improvements. The vein is about 19 feet wide, and rises in a bold outcrop which gives a large amount of surface ore, which is not yet half exhausted. A shaft has been sunk to a depth of 130 feet. The ore is a porous white quartz, with free gold in the cavities. Some galena is also found, and the indications are that in depth this galena will be much more abundant, and will perhaps enclose the gold, so as to render smelting necessary after concentration.

The mill has a capacity of 35 tons a day, and works about 200 tons a week. The production is nearly $1,000 per day, or $28,000 to $30,000 per month, or over $300,000 a year. The cost of labor and supplies is very great, partly on account of the Indian difficulties and the great distance from centres of supply. This mine was represented in the Exposition by specimen No. 213 of the California collection.

There are many veins in the region of La Paz upon the Colorado, and some near Williams's Fork, and the copper ores of both places contain gold as well as silver.

The bullion yield of Arizona for 1867 is estimated at $500,000.

NEW MEXICO.

The gold field of New Mexico has been known and worked since 1828. The portion so known is confined to the Placer or Gold mountains, about

20 miles from Santa Fé, towards Albuquerque. The yield of gold has been chiefly from placers, and was estimated by Wislizenus, in 1847, to vary from $30,000 to $250,000 a year, but it soon after diminished until it became comparatively insignificant. These placers are true hill deposits, affording coarse gold like that from the high placers of California. Owing to the absence of running streams there has been no opportunity to wash these deposits on a large scale. The gold which has been taken out was either obtained by "dry washing," or the earth was carted two miles to water to be washed.

Quartz veins are also found in the vicinity, and some shafts upon them are very ancient and the galleries extensive. The principal veins are the Ortiz and the Biggs. Gold also occurs in beds of quartzose sandstone, probably of the age of the Carboniferous, and has been worked to some extent in a mill erected by a Philadelphia company in 1857.[1]

Governor Arny, in his message to the legislature of the Territory, in December, 1866, mentions the discovery of lodes of gold-bearing quartz at Pinos Altos, and at San José, in the Sierra Madre, and near Fort Davis, in Texas. He also reports the existence of placers on the San Francisco and Mimbres rivers.[2]

The gold production of New Mexico for 1867 is estimated by Commissioner Browne at $500,000, but it probably does not exceed $300,000.

COLORADO.

The gold region of Colorado was represented in the Exposition by a large collection of the ores from the various districts, arranged under the direction of Mr. J. P. Whitney, the commissioner from the Territory. This collection filled two large cases, and was accompanied by a series of maps of the district and of photographs of some of the principal claims and mining towns. Mr. Whitney also published a pamphlet in English and French, descriptive of the Territory and its resources, with a list of the principal districts and claims.[3] A gold medal was awarded by the jury for this representation.

Gold was discovered upon the banks of the river Platte, near the present city of Denver, by some emigrants, in 1858. At that time there were very few white residents in the Territory, which now has a population of 36,000, exclusive of Mexicans and Indians. Denver, the capital, has a population of 7,000 to 8,000, and is situated upon the Platte, 12 miles from the foot of the mountains.

The counties of Bowlder, Gilpin, Clear Creek, Jefferson, and Summit, contain the principal gold localities. It is supposed, however, that other

[1] For further data by the writer upon these placers and the mineral resources of New Mexico, see Proc. Bost. Soc. Nat. His., vol. vii, p. 66.

[2] Cited in the report of J. W. Taylor, p. 325.

[3] Colorado in the United States of America. Schedule of ores contributed by sundry persons to the Paris Universal Exposition of 1867, With some Information about the Region and its Resources. By J. P. Whitney, of Boston, Mass., Commissioner from the Territory. London, 1867.

sections of the Territory contain gold-bearing veins, but no systematic explorations have been made. The principal mining has been in the counties of Gilpin and Clear Creek.

According to Mr. J. P. Whitney, from whose pamphlet most of this information is obtained, the gold veins traverse granite, and vary in width from a scarcely perceptible streak to 40 and even 50 feet, but seldom average over four or five feet.

The belts of country containing gold veins appear to have a uniform northeast and southwest course. In some districts the number of veins is very great, and they succeed each other with great regularity. In places they are so much broken and decomposed at the outcrops that the ground can be sluiced with profit.

The ores, as shown in the Exposition, are entirely different in appearance and composition from the ores of California. They are mainly composed of sulphuret of iron and copper, and quartz is hardly visible. The collection thus exhibited a brilliant metallic appearance, which was in strong contrast with the white auriferous quartz ores of California and other regions. Gold is rarely visible to the naked eye in these specimens, and can only be found by crushing and washing or by assay.

The presence of the veins is indicated on the surface by a light spongy quartz, discolored by the oxidation of the sulphurets, which also stain the soil by the deposition of oxide of iron. It is in these decomposed, rusted portions of the veins, between the surface and the water line, that the gold is free and in a condition to be separated from the ore by mechanical means. In the undecomposed or pyritous ore, which is found below the water in the veins, the case is quite different, the gold being so encased by the heavy pyrites that it cannot be wholly separated and amalgamated by stamping and washing in the usual manner, and it becomes necessary to resort to chemical means.

It is nevertheless the case that many mills are run upon this raw ore, and with fair returns, although probably a large part of the gold is lost. There are a few isolated instances where large profits have been made, but in such cases the ores doubtless were extremely rich. It is stated that during the present year (1867) the stamp mills have given an average of $24 per ton, but they have been supplied with the best ores.

Roasting in various ways has been tried with indifferent success, thus repeating the dear-bought experience of early quartz mining in California and the southern States, where it was early shown that roasting generally leaves the gold so coated or enfilmed that it will not readily amalgamate. The best practical results in Colorado have been obtained by smelting the ores so as to produce a matt which holds all the gold, silver, and copper, and is rich enough to bear transportation to Swansea, in Wales, for the separation of these metals. The presence of copper sulphurets in most of the ores renders this process more satisfactory and profitable, because the copper is utilized in the process at Swansea, and pays wholly or in part for the transportation. Some of the veins have

a preponderance of sulphuret of copper, and the assorted ores, in some instances, give from 20 to 30 per cent. of copper to the ton, and from $50 to $300 in gold. Ores which were sent, in 1866, to Swansea, yielded between $200 and $300 per ton, which, by the simple stamping and pan process, did not pay over $10 or $15 per ton. It is said that few of the veins contain less than from three to five per cent. of copper, and that this ore is usually the richest in gold.

Extensive smelting works have been erecting in Colorado the past summer for the production of matt upon a large scale, which is to be sent to Swansea for the extraction of the metals. The contents of the first matt obtained this year by the Swansea process was as follows per ton of matt: Copper, 37 per cent.; gold, 27 ounces; silver, 54 ounces. The works where this matt was produced have a capacity of seven tons a day only, and they are to be much enlarged.

In the review of Colorado mining processes and results, presented at the Exposition, it is stated that in the counties of Gilpin, Clear Creek, and Boulder, but chiefly in the two counties first named, there are 91 stamp mills, containing 1,698 stamps, varying in weight from 250 to 900 pounds each. There are, in addition, 41 other mills designed for Behr & Keith's, Crosby & Thompson's, Bertola's, Dodge's, Mason's, and processes other than mechanical; also smelting works at Black Hawk. Most of the mills are built of wood, and cost from $3,000 to $100,000 each. Most of them are driven by steam, some by water power.

The deepest shaft in 1866 was upon the Burroughs lode, in Nevada district, Gilpin county, which had attained a depth of 525 feet, and proved the existence of fine ore at that depth. Shafts have also been sunk upon the Gold Dirt, Bobtail, and the Gregory lodes to a depth of between 300 and 400 feet, with satisfactory results.

It is impossible to obtain accurate statistics of the amount of gold shipped from Colorado since the discovery. Mr. J. P. Whitney estimates it as not less than $30,000,000, and the production for the past year (1867) at $5,000,000. The official returns, however, do not show so high a yield, and it is stated at $2,500,000. The production from gulch diggings has been large, especially on the western side of the mountains.

The occurrence of washed gold in extremely thin scales has been cited by the writer as low down on the great plains as the old crossing of the Arkansas river, near Fort Atkinson. A sample of placer gold from this river, taken out higher up, yielded .971 by assay at the Dahlonega branch mint, in 1858, and was worth about $20 an ounce, nearly the same as the gold from the old and new placer in New Mexico.[1]

DAKOTA.

Accounts have recently been received of an extensive region of gold veins and placers in the region of the Sweetwater river, near the South

[1] Mineral Resources of New Mexico, W. P. Blake, Proc. Bost. Soc. Nat. Hist., vii, p. 64, July, 1859.

Pass. Large numbers of miners and prospectors were reported to be flocking there from Idaho, Montana, Nevada, and California. The Sweetwater mining region is divided into five mining districts: Shoshone, California, Mill, Pacific, and Kentucky Home. The Atlantic ledge in California district is more thoroughly prospected than any other. A shaft 70 feet deep has been sunk on the vein, and at that point it is said to be 20 feet wide. Good placers are reported and sluices have been laid in Atlantic Gulch. Timber and water are abundant. Rich placers are reported on the head-waters of Wind river and in the Big Horn mountains.

APPALACHIAN GOLD FIELD.

In the year 1799 Conrad Reed, a boy 12 years of age, picked up a piece of gold in the bed of a small stream on his father's farm in Cabarras county, North Carolina. It was not recognized as gold, and was kept for several years in the house to hold the door open, and was finally sold to a silversmith for $3 50. This mass was about as large as a small smoothing iron, and several other masses of large size were afterwards found in the same stream, the largest of all being the 28 pound lump, so often mentioned. There was no excitement in regard to gold until 1829, when placers were opened in Burke and McDowell counties, in the same State, and from these mines the gold was traced southward into Georgia, where it was first discovered on Duke's creek, in Habersham, now White county, in part. This discovery was made by a negro named Charles, when on his way from North Carolina to one of the towns in Georgia. From this discovery the metal was traced into Lumpkin county, and thence across Georgia into Alabama. A great rush for the newly discovered gold mines succeeded, and a large amount of gold was taken out of the beds of the streams and from the hill-deposits of gravel. This gold belt is a mountainous region; the deposits are very much like those of California, and many of them were astonishingly rich. The gold deposits were also traced northward into Virginia, and many valuable mines have been opened and worked there.

This gold field, which stretches southwesterly from Virginia through North Carolina, South Carolina, and Georgia, is not an unbroken or continuous zone of occurrence of the precious metals, but is composed of many subordinate belts, occurring at intervals, and generally parallel with each other, though often many miles distant. In North Carolina there are two principal belts, one of which extends across the State through Mecklenburg, Cabarus, Rowan, Davidson, and Guilford counties, and the other extends through Rutherford, Burke, and McDowell counties, and is from 10 to 20 miles distant from the base of the principal ranges of the Blue Ridge. This last is the most western of the two belts, and it is much more elevated than the first, and has more extensive and richer placer deposits. This is the belt of gold deposits which was traced into northern Georgia, and forms the gold region of the vicinity of

Dahlonega, and this region, as in North Carolina, is separated from another gold-producing zone by an intermediate barren region.

Quartz veins are found in both of these principal auriferous zones, and they closely resemble the quartz veins of California in appearance and in their contents. Gold is found either free, in coarse grains, or in fine particles, disseminated in sulphuret of iron or copper. Some of the veins which yielded gold freely at the outcrops, where the pyritous ore had decomposed, have been worked for copper ore in depth. One of the vein mines in North Carolina, the Gold Hill group, is said to have yielded over $2,000,000.

The deposits of gold from the Appalachian mines at the mint and its brances, between 1804 and July, 1867, are reported as follows:[1]

This is believed not to represent the entire production, for a very large amount was undoubtedly used in manufactures and did not reach the mints for coinage.

Virginia	$1,580,388 72	Alabama	202,172 13
North Carolina	9,344,933 29	Tennessee	81,406 75
South Carolina	1,354,864 52		$19,564,215 11
Georgia	7,000,439 70		

As the best placers were worked out the production rapidly diminished, and when the great discoveries in California were made known the placer deposits and many of the veins were abandoned for the new El Dorado. The most skilful of the miners in California at an early date were those who had already had some practical experience of mining in the southern States. The following table, showing the amount of gold from Georgia deposited at the Philadelphia mint and Dahlonega branch mint up to the close of the year 1855, will show the rapid decrease in the production:

1828 to 1837	$1,763,000	1852	$96,542
1838 to 1847	3,544,669	1853	58,896
1848	254,746	1854	54,588
1849	236,349	1855	58,419
1850	209,587		$6,434,909
1851	157,213		

The quality of the gold from the different placers and veins along the gold field varies considerably, as it does in California and other gold fields. The average quality of Georgia gold is, however, rather above that of California, as is shown by the following averages of a great number of assays of the bullion from the principal stream deposits and vein mines of Georgia:

Auraria, Lumpkin county, vein and placers	.950
Dahlonega, Lumpkin county, vein	.925
Lewis mine, Lumpkin county, vein	.899
Calhoun vein, Lumpkin county, vein	.900

[1] Report of the Superintendent of the United States Mint.

New York vein, Lumpkin county, vein	.900
Loud deposit, Lumpkin county, placer	.880
Loud deposit, Lumpkin county, placer	.830
Asbury and Craigs, Lumpkin county, placer, (near Loud Deposit)	.819
Pasco mine, Cherokee county, vein	.950
Bell mines, Cherokee county, vein	.975
Stricklan, Cherokee county, vein	.950
Elrod, Hall county, vein	.906

If we leave out the assays of gold from the Loud deposit, which is peculiar for its amount of silver, the average of all becomes 928 thousandths. California gold is usually estimated at 875 to 900 thousandths fine.

In the State of New Hampshire gold has been found in alluvial deposits of limited extent on the flank of the Green mountains, and some of the placers have been worked with fair success by individuals, but the total production is insignificant compared with other regions. Within the past three or four years some attention has been given to veins of gold-bearing quartz in that section. Neither these mines nor those of the southern States were represented in the Exhibition.

CANADA.

The Geological Commission of Canada exhibited gold from the alluvial deposits of the valley of the Chaudière river.

This gold appears to be derived from the degradation of the metamorphic rocks of the Upper Silurian and the Devonian periods. These rocks are found to be traversed by numerous veins which carry sulphurets of iron, zinc, copper and molybdenum, and argentiferous galena with native gold. The alluvial deposits derived from the abrasion of these veins and the enclosing rocks cover a great extent of country to the southeast of the Notre Dame mountains, and are found to be auriferous. This placer or alluvial gold is sometimes accompanied by a little platina and iridosmine.

Mining in the region has been confined chiefly to the alluvial deposits, and it has been attended with considerable success in some places. One of the most productive and extensive deposits is upon the Gilbert river, on the De Lery grant. The gold is quite coarse and heavy.

NOVA SCOTIA.

The Gold Commission of Nova Scotia exhibited a collection of gold nuggets and of auriferous quartz from the various gold fields of the province. Other collections of minerals and ores were sent by Mr. H. How.

Among the most prominent or interesting specimens the following may be noticed:

Gold in quartz from Hamilton, Tangiers. This gold is remarkable for

its purity and rich yellow color. Similar specimens were shown from Oldham, containing also iron pyrites and mispickel, with which the gold is closely associated. The walls of this vein appear to be a black graphitic slate similar to that of the Hayward mine in Amador county, California, and at the Princeton vein on the Mariposa estate. There was, also, an interesting series of specimens from Renfrew, Isaac's Harbor, and Montagu. These ores occur in the Lower Carboniferous conglomerate of Gray's river.

One of the most remarkable deposits of quartz yet found in Nova Scotia is on Laidlaw's farm, Waverly. It is in a horizontal bed from eight to ten inches thick, and is corrugated to such a degree that where uncovered it looks like a layer of logs or trees side by side, as they are placed in making corduroy roads. It also resembles an assemblage of small casks placed end to end, and from this circumstance the miners have given the name "barrel quartz" to the formation. The general course of the quartz veins is north 60° west, and their dip is toward the southwest. The gold was first discovered at the head-waters of the Tangier river, and other localities were soon discovered in succession at the Ovens, Lunenberg; at Lawrencetown, Dartmouth, Sheet Harbor, Isaac's Harbor, Sherbrooke, Waverly, and Oldham.

A report upon the gold region of Nova Scotia has recently been made by Dr. T. Sterry Hunt, F. R. S., and addressed to Sir W. E. Logan, director of the geological survey of Canada,[1] to which reference may be made for full details of the geology and of the present condition of the mines. A few extracts are here given:

"Although the Acadian Geology of Dr. Dawson was published in 1855,[2] some years before the discovery of gold, there will be found in its fifteenth chapter a somewhat detailed description of the coast district of Nova Scotia, which has since become famous as a gold region. This consists of a zone of ancient stratified rocks lying exposed between the overlying strata of the Carboniferous system on the northwest and the ocean on the southeast, and having a breadth of from 30 to 50 miles in the wider portions, which to the northeast is reduced to not over eight miles. This belt of rocks extends along the Atlantic coast for a distance of about 250 miles, from Cape Sable on the west to Cape Canseau on the east, and has a superficies of about 6,000 square miles. Its surface is generally low, rising, however, in some places, to about 500 feet above the sea, and is in great part rocky and barren, the powerful denuding agencies to which, in past times, it has been exposed, having, over a large portion of the area, removed the alluvial deposits with which it was once covered and left the upturned and worn edges of the strata bare, or covered only with boulders of quartzite or granitic rocks. A large portion of this region is still an unexplored wilderness, and some of the most important gold districts are in localities which, until the discovery of the

[1] Printed by order of the House of Commons, Ottawa, 1868.

[2] A second and much enlarged edition of this work is now in press, and will shortly appear.

precious metal, were unreclaimed forests, so that it is in every way probable that further explorations may detect many other districts not less important than those already known.

"The rocks of this region consist chiefly of slates and quartzites; they are, however, cut in many places by intrusive granites, and in addition to these several small areas of gneissic rocks occur in different parts of the belt, but their true relations to the great mass of the strata are not yet clearly made out. Leaving these aside, the rocks which cover the principal part of the area under consideration are, by Mr. Campbell, divided into a quartzite group and a clay-slate group, the latter conformably overlying the quartzite, and the two constituting one gold-bearing series. The total measured thickness of these two divisions is, according to the same authority, nearly two miles; but the gold appears to be chiefly confined to the quartzite, and the lower portions of the clay-slate division. The geological age of these rocks is uncertain; although comparatively little altered, they are without fossils, so far as yet known, and are very unlike the fossiliferous Upper Silurian and Devonian rocks met with in other parts of the province; at the same time the high antiquity of the gold-bearing strata is shown by the fact that the Carboniferous system rests upon their upturned edges, and is partly formed from their ruins. In the present state of our knowledge it appears probable that they may represent a part of the Lower Silurian series, which, like the Upper Silurian and Devonian of this part of the continent, may be supposed to consist chiefly of non-calcareous sediments.

"The rocks of the gold series are affected by undulations running nearly east and west, which have raised the strata to high angles, often approaching the vertical. According to Mr. Campbell there are not less than six principal anticlinals exhibited on a transverse line of section, extending from the sea-shore at the southeast entrance to Halifax harbor, northward to the Renfrew gold district, a distance of about 35 miles. The direction of these nearly parallel anticlinals is about east and west; but to the westward they bend towards the south, and to the eastward, in like manner, disappear beneath the sea, between Cape Canseau and Liscombe harbor, with a strike east 30° south.

"In addition to the great east and west folds the gold series is affected by a second series of more gentle undulations, having a north and south direction, and producing transverse anticlinals, on the crowns of which the gold-bearing portions of the series are brought to the surface, while they are concealed not only in the great east and west synclinals, but also in the north and south synclinals where these traverse the east and west anticlinals. The total thickness of the series, as already stated, is estimated at about two miles, and the amount of erosion on the crowns of some of the anticlinals, according to Mr. Campbell, cannot be less than one and a half mile in vertical thickness, of which the upper half mile, consisting of clay-slates, is generally sterile. Since, so far as yet observed, the gold is confined to the quartzite and the lowest portions of the over-

lying clay-slate, it would follow that wide areas of the latter, holding the upper portions of it, will be destitute of gold, or yield it only along a narrow belt where the lower and auriferous portions of the slate may be brought to the surface along the line of an anticlinal, as is observed, according to Mr. C., at the Ovens gold field. When, on the contrary, erosion has exposed a wide zone of the underlying quartzite on the crest of an anticlinal, the breadth of the area in which gold may be sought for is much increased.

"Mr. Campbell has called special attention to what he has called the grain or reed-like marking often impressed on the surface of the beds in a direction parallel to the east and west axes of folding, and he points out that the angle of dip, eastward or westward, of these markings on the crown of the great anticlinals enables us to detect the transverse or north and south lines of undulation, which have at a subsequent period disturbed the horizontality of the east and west anticlinal folds. The markings in question often appear as rib-like ridges or flutings, which are most conspicuous on the surface of the auriferous quartz layers and the enclosing beds. On the summit of the anticlinal folds they are sometimes so large and so well defined as to give to the layers a wrinkled or corrugated form, producing what is designated in the region as barrel quartz, and has by some observers been compared to the ripples on water, and by others to that parallel arrangement of logs which is seen on what is called a corduroy road. The best known sample of this is at Waverly, but it is also seen at Montague, Oldham, and at Upper Stewiacke.

"Having thus acquired a general notion of the geological structure of the region, we may consider its lithological characters, which are very simple. The quartzite which forms the principal rock of the lower division, interstratified however with thin layers of bluish argillite or clay-slate, is essentially a granular quartz rock, with an apparently argillaceous cement, sometimes considerable in amount. It is hard and gray in color, passing into blackish or greenish in the interior, but becoming nearly white on weathered surfaces. Its lines of bedding are distinct, and besides two sets of joints which often cause it to break into regular rhombic masses, it occasionally shows a slaty cleavage, independent of the bedding, and from a development of mica in the cleavage planes, passes into a very quartzose mica slate. The quartzite of this region is by the miners generally designated as *whin*, the vulgar name in Scotland for a greenstone or diorite, which somewhat resembles it in color and texture, though a softer rock than the Nova Scotia quartzite.

"The slate, which is interstratified in thin bands with the quartzites, and frequently forms the underlying rock of the gold-bearing quartz lodes, is generally a soft and fissile, blueish or blackish argillite, or clay-slate, and the same may be said of the strata which forms the base of the upper or clay-slate division of the gold series, so far as I have had an opportunity of observing it. A peculiarity of this region, which strikes every mineralogist, is the great rarity of everything like calcareous rocks

or minerals. This is seen in the absence of limestone, serpentine, diorite, or other hornblendic rocks, and of talcose or chloritic slates, nothing of the kind being met with in most of the gold districts. Professor Silliman, however, mentions the rare occurrence of chloritic slate, and also of epidote and staurotide in minute crystals in the Tangier district, and of a green magnesian rock resembling serpentine and holding gold, at Wine harbor. Small portions of chlorite are found in the quartz lodes at Sherbrook, Oldham, and Montague. Chloritic and hornblendic rocks, according to Dr. Dawson, occur near Yarmouth, and in the peninsula which terminates in Cape Canseau, fine-grained gneiss with much mica slate, and clay-slates abounding in crystals of chiastolite, are met with."

METALLIFEROUS LODES.

"In the series of rocks just described gold is occasionally met with disseminated both in the quartzite and in its accompanying bands of slate; but it is chiefly found in well-defined beds or layers of a more or less pure quartz, which are generally very distinct from these rocks, although interstratified with them. Besides these there are other quartz lodes which cut or intersect the strata, filling cross fissures, which, according to Mr. Campbell, are generally connected with the north and south lines of elevation. These cross veins are irregular, seldom continuous, and, though sometimes carrying gold, are of little economic importance and seldom wrought. The fact that the productive quartz lodes of Nova Scotia are conformable with the stratification has been insisted upon both by Messrs. Silliman and Campbell. The latter, who conceives them to be newer than the strata, and to have been formed in openings or separations between the beds of slate and quartzite, mentions that the lodes in some instances pass from the plane of one bed to another, in descending. In one supposed instance pointed out to me, this appearance seemed due to a small fault running east and west, parallel with and near the crown of a great anticlinal. In other cases this apparent change of plane depends, I think, upon irregularities in the bedding, and the intercalation of lenticular masses of argilite or quartzite in the layers of metalliferous quartz. The beds of all these materials occasionally thin out and disappear in the strike or dip, and in some cases beds of quartz, separated by layers of interposed rock, are found to unite, further on, into a single bed. So far as my present observation goes, I think that to describe them otherwise than as interstratified beds would be to give a false notion of their geognostic relations. The laminated structure of many of the lodes, and the intercalation between their layers of thin continuous films or layers of argillite, can hardly be explained in any other way than by supposing these lodes to have been formed by successive deposition at what was, at the time, the surface of the earth. There is, moreover, evidence that these laminæ were formed before the lodes were folded and contorted; this is furnished by some remarkable specimens of the so-called barrel quartz which I took from a lode at Upper Stewiacke, and which

consists of a bluish quartz in thin plates, sometimes not more than one-twentieth of an inch in thickness, and presenting in some instances glazed surfaces coated with thin argillaceous films, and in others, pellicles of argillite having the thickness of paper. The surfaces of all these layers are deeply striated or furrowed at right angles to the axis of the larger convolutions of the bed, a result evidently due to a sliding of the layers of the quartz lode over one another during the corrugation of the strata, which has here taken place near the summit of the anticlinal. It seems not improbable that the corrugated structure of the lodes, which gives rise to the barrel quartz, is due to the difference in texture, and to the greater resistance to lateral pressure offered by the quartz layers than by the enclosing beds of clay and sandstone, which by their consolidation have given rise to the argillites and quartzites. There is, moreover, evidence that during the movement of the strata openings and fissures were in some cases formed in these quartz lodes, giving rise to joints in which gold, metallic sulphurets, and carbonate of lime were afterwards deposited, apparently by solution and segregation from the adjacent parts of the lode."

GOLD PRODUCTION OF NOVA SCOTIA.

A gilded pyramid.in the Exposition represented the bulk of the gold extracted from the Nova Scotia mines from January, 1862, to the month of September, 1866, according to the official reports. This pyramid was about five feet high and 18 inches square at the base. The total weight of the gold so represented was stated to be 2,634 kilograms and 393 gramms; its value 8,161,579 francs, or about $1,632,315.

The following are the official returns of gold obtained from Nova Scotia, from 1860 to 1866:

Production from 1860 *to* 1866.

Period.	Average No. of men employed.	No. crushing mills.	Steam power.	Water power.	Quartz, sand, & gravel crushed.	Yield per ton.	Gold from alluvial mines.	Total yield of gold.
					Tons. cwt. lbs.	*Oz. dwt. gr.*	*Oz. dwt. gr.*	*Oz. dwt. gr.*
Year ending December 31, 1862	484	30	18	12	6,401 0 0	1 1 1	311 0 0	7,275 0 0
Year ending December 31, 1863	877	35	25	10	17,001 14 15	0 16 12	28 0 0	14,001 14 17
Nine months ending September 30, 1864	830	35	23	12	15,316 14 0	0 19 0	38 11 3	14,565 9 8
Year ending 1865	692	33	23	10	23,835 11 0	1 0 21	141 0 7	24,867 5 22
Total					62,554 19 15			60,709 9 23

The statistics of production are given by Mr. Taylor[1] in dollars as follows:

1862	$145,500	1864	$400,440
1863	280,020	1865	509,080

He further states that the statistics exhibit very accurately the average yield per man, which in 1863 was 95 cents a day; in 1864, $1 39; and in 1865, $2 13. The ingots or bars of Nova Scotia gold are current in Halifax at $20 per ounce. The assays made by Professor Silliman show values of $19 97 and $20 25. The gold commissioner of Nova Scotia assumes $19 50 per ounce as the basis of his calculations of the value of the gold product of the province.

A table from the report of the chief commissioner of mines, showing the returns of the gold mines of Nova Scotia for the year ending September 30, 1867, is given on the next page. In this table are given for each gold district the average daily labor employed, the number of mills with steam or water power, the number of tons of quartz crushed, the average yield of gold to the ton, the quantities of alluvial gold, the total amount of gold, and finally, the annual return for each miner employed, the price of gold being estimated at $18 50 the ounce, which, as we have seen, is considerably below the real value. A column giving the maximum yield per ton from each district has been omitted, inasmuch as it is deduced from the treatment of lots of ore of exceptional richness. Dr. Hunt says:

"It is impossible to determine with precision the total amount of gold obtained from the mines of Nova Scotia since their discovery. The Department of Mines was not organized until 1862, and it was not until the following year that complete returns were obtained. From this it results that no accurate estimate can be given of the amounts of gold obtained in 1860, 1861, and 1862, though they are supposed to have been not inconsiderable. The official returns for the last six years, based on the gold for which the royalty of three per cent. has been paid, are as follows:

	Ounces.
1862	7,275
1863	14,001¾
1864	20,023
1865	25,454¼
1866	25,204½
1867	27,583
Total	119,541½

"The value of the above amount of gold, at the government price of $18 50 the ounce, is $2,211,508; but at $20, which is about the worth of

[1] Report of J. W. Taylor, p. 337.

the Nova Scotia gold, it amounts to $2,390,081. If to this we add the unreported gold obtained in the first two or three years, we may conclude that the whole product has been equal in round numbers to about two and a half millions of dollars."

The following is a detailed statement showing the average daily labor employed, the amount of quartz crushed, the yield of gold per ton of quartz, the quantities of gold from alluvial mines, the yield of gold per ton in each district and in the whole province, and the value of the average yield of gold per man employed in mining, for 12 months ending September 30, 1867:[1]

Production of the mining districts for one year.

Districts.	Average men employed.	Crushing mills employed September 30, 1867.	Steam power.	Water power.	Tons of quartz, &c., crushed.	Yield per ton.	Alluvial gold.	Total yield of gold.	Average yield per man for 12 months at $18 50 per ounce.
						oz. dwt. gr.	oz. dwt. gr.	oz. dwt. gr.	
Stormont, (Isaac's Harbor)	45	2	2	....	1,149	1 5 8	.....	1,505 2 11	$618 73
Wine Harbor	33	4	3	1	1,667	8 13	.....	764 9 9	428 60
Sherbrooke	99	5	5	....	5,809	1 9 8	.....	8,522 8 11	1,592 58
Tangier	19	4	2	2	486	16 7	20 6 0	395 16 10	385 50
Montague	19	1	1	....	214	1 19 0	.....	417 13 21	406 60
Waverley	181	5	4	1	11,289	7 7	.....	4,134 18 17	422 63
Oldham	52	4	3	1	960	1 8 7	.....	1,359 12 2	483 88
Renfrew	189	5	3	2	7,770	1 4 4	.....	9,401 2 10	895 30
Uniacke	30	3	3	....	1,212	15 15	.....	947 1 17	584 00
Unproclaimed, and other districts	9	2	1	1	117	1 3 4	28 15 15	135 0 21	278 55
	676	35	27	8	30,673	17 23	49 1 15	27,583 6 97	$765 00

MEXICO.

Most of the gold produced in Mexico is found associated with the ores of silver. The average annual production in the present century, according to the mint returns, has ranged from $500,000 to $1,300,000. It is believed, however, that only about three-eighths of the total product of gold passes through the mints. Upon this hypothesis Mr. Danson calculates that the total production of gold in Mexico, from 1804 to 1847, was nearly $85,000,000.[2] Duport estimated the value of the gold mined in Mexico as about one-eighth that of the silver, and its weight, including the gold separated from silver, as $\frac{1}{135}$ of that of the silver.

[1] From the report for 1867 of Hon. Robert Robertson, chief commissioner of mines for Nova Scotia, appendix B.

[2] Vide Chapter V, under "Silver," and Jour. Stat. Soc., Lon., viv.

PRODUCTION OF GOLD AND SILVER IN THE UNITED STATES AND TERRITORIES.

PRODUCTION IN THE YEAR 1867.

The following tabular statement of the value of the total production of the precious metals in the United States and Territories for the year 1867 is prepared from the data given in the foregoing pages. The figures are in round numbers; they are in part estimates, and are to be regarded as close approximations, it being impossible to obtain the *exact* amounts. The data show that the value of the total production for the year is $71,000,000. Of this, $56,000,000 is considered to be in gold bullion, and $14,500,000 is silver, this being exclusive of the value of the gold in the bullion from the Comstock lode. One-third of the value of the Comstock bullion, and a little over one-fifth of the value of the Idaho production is regarded as gold. The aggregate value of the gold and silver bullion is given in the last column. The estimated value of the silver bullion is given in the second column, and the value of the gold bullion is obtained by subtracting the value of the silver from the total value. As the returns of production of gold and silver are not separately made, it is not possible to segregate the exact value of each, and only estimates can be given.

One-third of the value of the Comstock bullion and a little over one-fifth of the value of the Idaho production is regarded as gold.

Bullion production of the United States and Territories in 1867.

States and Territories.	Value of gold bullion.	Value of silver bullion.	Total value of bullion.
California	$25, 000, 000		$25, 000, 000
Nevada	6, 000, 000	$12, 500, 000	18, 500, 000
Oregon and Washington	3, 000, 000		3, 000, 000
Idaho	5. 000, 000	1, 500, 000	6, 500, 000
Montana	12, 000, 000		12, 000, 000
Arizona	500, 000		500, 000
New Mexico	300, 000		300, 000
Colorado	2, 000, 000	500, 000	2, 500, 000
Utah, Appalachian, and other sources not manifested	2, 700, 000		2, 700, 000
Totals	$56, 500, 000	$14, 500, 000	$71, 000, 000

This, it will be seen, differs from the estimate made by Commissioner Browne in the report upon the mineral resources of the United States for 1867. He considers $75,000,000 to be a near approximation to the total gold and silver product of the United States for the year ending January 1, 1868. He places the product of Nevada at $20,000,000, and makes an allowance of $5,000,000 to cover bullion derived from unknown sources, and unaccounted for by assessors and express companies.

There is room for a wide difference of opinion in regard to the production of gold in remote sections of the Pacific coast whence the bullion reaches San Francisco through a variety of channels; but it is believed

that the only safe guides for estimates of the yield are the regularly reported shipments by the express companies and the records of exports from San Francisco.

In regard to the difficulty of collecting statistics of mining and of the bullion product of the United States, Commissioner Browne makes the following just observations:

"There is no subject upon which greater difference of opinion exists than that of mining statistics. It is an open field in which there is room for discrepancy under any existing circumstances. No two persons rate the product of the precious metals alike. The superintendent of a mine often furnishes information which, when submitted to the board of directors, is pronounced incorrect. Representatives from the mining districts are apt to rate both population and products higher than persons who have made them special subjects of inquiry, but whose opportunities for judging may not be so favorable.

"A fruitful source of error is in supposing that the ordinary channels of transportation cannot be relied upon as a clue to the gross products of the mines. It is alleged that large quantities of the precious metals are carried away in the pockets of the miners. Even if this were so, it is not reasonable to suppose that the miners continue to burden themselves with their treasure after arriving at their place of destination. It must find its way into the mint or branch mints for coinage, or the custom-house manifests for exportation. It cannot be assayed without paying its internal revenue tax. The gross yield of all the mines can be determined with approximate accuracy. It is more difficult to arrive at a subdivision when it comes to the product of each State and Territory.

"In California, for example, during the early days of placer mining, before the transportation of bullion by organized companies had become a business entitled to confidence, a large proportion of the gold derived from the mines was carried out of the country by private hands. There was comparatively little danger of loss. The routes to San Francisco were short, public, and protected by general interest. From that point to New York the passengers usually combined for mutual protection, and the risk was inconsiderable. It was not until the idle and profligate began to obtain an ascendancy, the business of transportation by express more firmly established, and the mines more difficult to work with profit, that the increase of risks and reduction of charges resulted in the general abandonment of this system. It doubtless prevails to a limited extent now, but the transportation of bullion by private hand in California is exceptional. It probably does not exceed seven per cent. in the aggregate, and this applies only to the routes by which it reaches San Francisco.

"In reference to silver, it is impossible that any considerable amount can escape notice in this way. The yield of Nevada can be determined with more accuracy than that of other States. Silver predominates in the mines, and where gold is obtained it is not in an uncombined form.

"When we come to Montana, Idaho, Washington, and Oregon, the

greatest difficulty is experienced. Shipments of treasure from Montana and Idaho may become incorporated with others before reaching their destination. From Montana most of the bullion goes east. Two main routes are open to examination—one by the Missouri river, the other by Salt Lake City. Indian disturbances and the insecurity of the roads have, during the past year, almost entirely closed the latter, so that the chief exit is by the former route. Shipments from Idaho are made chiefly by way of Portland, and the inland stage-route through Humboldt and across the Sierra Nevadas. On both of these routes it is alleged that they are liable to become merged with the products of other States and Territories. It has been impossible to obtain an account of the shipments from each agency at the express office of Wells, Fargo & Co., at San Francisco For reasons of private expediency they refrain from giving the desired information. We have, however, the aggregate receipts at their office, and knowing very nearly what amount can fairly be credited to California, Nevada, and British Columbia, can draw reasonable conclusions as to the proportion derived from Idaho, Washington and Oregon.

"The bullion product of Washington is estimated by the surveyor general at $1,500,000. That of Oregon is stated as high as $2,500,000. Intelligent residents at Idaho and Montana represent that the figures given in the above estimate, so far as these Territories are concerned, are entirely too low, and might be doubled without exceeding the truth. The product of Idaho alone, for this year, is said to be from $15,000,000 to $18,000,000. That of Montana is estimated by the surveyor general at $20,000,000. Similar exceptions are taken to the estimates of Colorado, New Mexico, and Arizona. As I have no grounds for accepting these statements, beyond the assertion that most of the bullion is carried away in the pockets of the miners, I am inclined to rely upon the returns of the assessors, express companies, and official tables of export. Admitting that a fraction over seven per cent. may have escaped notice, although reasonable allowance is made for this in the estimates of $70,000,000, and that a considerable sum may be derived from sources not enumerated, I feel confident the additional allowance of $5,000,000 is sufficient to cover the entire bullion product of the United States for the year 1867, thus making the aggregate from all sources $75,000,000, as stated in the report of the Secretary of the Treasury."

TOTAL BULLION PRODUCTION OF THE UNITED STATES FROM 1847 TO 1868.

The production of bullion upon the Pacific coast for the past 20 years has already been stated, p. 21, as amounting in round numbers to $995,944,990. This includes the product of Nevada, Idaho, Oregon, Washington, Arizona, British Columbia, in part, and some from the Mexican coast. It is impossible to ascertain with any precision what portion of this aggregate should be credited to each of these States and Territories, but an allowance of $35,000,000 in round numbers may be

made for the production of British Columbia, and for the receipts from the Mexican coast, which sum having been produced beyond the limits of the United States is to be deducted from the aggregate, leaving $961,000,000, as shown, p. 21.

The following résumé is presented as an approximate estimate of the total bullion product of the United States for 20 years to 1868, and reference is made in explanation to the tables and figures in detail under each State and Territory noticed in the preceding pages:

California, Nevada, Idaho, Oregon, Washington, and Arizona	$961,000,000
Montana	72,000,000
Colorado	30,000,000
Appalachian gold region	10,000,000
New Mexico, Utah, and other unenumerated sources	2,500,000
Total	$1,075,500,000

REVENUE TAX FOR 1867.

The revenue tax of one-half of one per cent. imposed upon all bullion submitted to assay during the year 1867 affords an indication of the bullion production for that period. The tax paid upon gold bullion amounted to $313,618 40 in currency, and upon gold bullion to $90,374 98 in currency. The total estimated value *in coin* of the gold and silver bullion upon which the tax was paid was $58,175,047, this estimate being based upon the assumption that the premium on gold for the year was 38⅝ per cent., or that $1 in currency was worth 72 cents in coin. The amounts assessed and paid in the different States and Territories are shown in the following table prepared at the office of the Commissioner of Internal Revenue:

States and Territories.	Total value of gold and silver bullion, in currency.	Estimated value of gold bullion, in coin.	Estimated value of silver bullion, in coin.	Total estimated value of gold and silver bullion, in coin.
California	$40,055,748	$27,844,811	$995,328	$28,840,139
Colorado	289,490	208,433	.....	208,433
Idaho	1,472,428	817,937	242,211	1,060,148
Montana	2,282,828	1,643,573	63	1,643,636
Nevada	24,177,282	6,316,589	11,091,054	17,407,643
New York	6,229,591	4,052,199	433,109	4,485,308
Oregon	2,005,842	1,443,542	664	1,444,206
Pennsylvania	3,155,428	2,020,340	251,568	2,271,908
Utah	817,432	588,551	.....	588,551
Washington	312,604	225,075	.....	225,075
Total	$80,798,676	$45,161,050	$13,013,997	$58,175,047

DEPOSITS AND COINAGE AT SAN FRANCISCO, 1867.

The following statement furnished to the San Francisco Mercantile Gazette by the superintendent of the San Francisco branch mint of the United States shows the deposits and coinage there during the year ending December 31, 1867:

	Value.
Gold deposits	$18,923,152 17
Silver deposits and purchases	613,117 94
Total deposits	$19,536,270 11

The deposits for the year ending December 31, 1867, were of the following character:

GOLD.

California bullion	$5,700,871 12	
Idaho bullion	1,144,483 04	
Oregon bullion	319,620 90	
Montana bullion	309,843 32	
Nevada bullion	49,030 47	
Arizona bullion	48,797 73	
Parted from silver bullion	168,901 92	
		$7,741,548 50
Fine bars	$10,980,791 94	
Foreign coin	153,453 31	
Foreign bullion	47,358 42	
		11,181,603 67
Total gold		$18,923,152 17

SILVER.

Nevada bullion	$205,618 87	
Arizona bullion	8,425 74	
Idaho	39,727 45	
Parted from gold bullion	69,999 56	
		$323,771 62
Bars	$239,799 25	
Foreign coin	27,595 31	
Foreign bullion	21,951 76	
		289,346 32
Total silver		$613,117 94
Silver bars stamped		$20,534 92
Total gold and silver		19,536,270 11
Fine bars, total		20,534 92

Statement of coinage executed.

Denominations.	No. of pieces.	Value.
GOLD.		
Double eagles	920, 750	$18, 415, 000 00
Eagles	9, 000	90, 000 00
Half eagles	29, 000	145, 000 00
Quarter eagles	28, 000	70, 000 00
Total	986, 750	$18, 720, 000 00
SILVER.		
Half dollars	1, 196, 000	$598, 000 00
Quarter dollars	48, 000	12, 000 00
Dimes	140, 000	14, 000 00
Half dimes	120, 000	6, 000 00
Fine bars	20	20, 534 92
Total	1, 504, 020	$650, 534 92
RECAPITULATION.		
Gold coinage	986, 750	$18, 720, 000 00
Silver coinage	1, 504, 020	650, 534 92
Total	2, 490, 770	$19, 370, 534 92

CHAPTER II.

GOLD REGIONS OF SOUTH AMERICA, CENTRAL AMERICA, AUSTRALIA, AND NEW ZEALAND.

BRAZIL—MORRO VELHO AND OTHER MINES—CHILI—ARGENTINE REPUBLIC—BOLIVIA—PERU—VENEZUELA—NEW GRANADA—CENTRAL AMERICA—AUSTRALIA—GOLD VEINS OF VICTORIA—AUSTRALIAN PLACERS—AGE OF THE DEPOSITS—PRODUCTION OF GOLD IN VICTORIA—QUARTZ MILLS AND MACHINERY—CLUNES, AND OTHER MINES—PORT PHILIP AND COLONIAL COMPANY—NEW SOUTH WALES—EXPORTS OF GOLD—SOUTH AUSTRALIA AND TASMANIA—QUEENSLAND—NEW ZEALAND—STATISTICS OF PRODUCTION.

BRAZIL.

Gold is found in many places throughout the empire of Brazil, but the richest mines yet known are in the province of Minas Geraes, and in the district of Turyassu, in the province of Maranhao. Mining is also conducted on a small scale in the provinces of St. Paulo and Parana, and of Rio Grande do Sul. The metal also occurs in the province of Ceara, on the slopes of the Serra de Ibiapaba, district of Ipu; at the mines of Mangabeira, near Granja, and in the mountains near Baturité. Veins are found at Piancona, in the province of Parahyba,[1] and placers are worked at Mate Grosso.

In some localities palladium is always found associated with the gold, and analyses at the mint in Rio Janeiro have shown the existence of alloys in the following proportions:

Gold	88.9	90.25	92.3
Palladium	11.1	9.75	7.7

Plates of this natural alloy, together with specimens of pure palladium, in plates, wire, and ingots, were shown at the Exposition.

The greatest production of gold in the empire was from the placers, about the middle of the 18th century. The amount on which the royal fifth was paid varied from 17,000 to 21,500 pounds yearly. In 1822 the production was less than 1,000 pounds. According to Humboldt the mean annual production of Minas Geraes from 1810 to 1817 was 4,288 pounds. This large production was obtained chiefly from the placers of the district of Minas Geraes, but these placers became exhausted, and at the present time the chief gold production of Brazil is from the veins or beds worked by English companies.

The rock formations in which the gold occurs are highly metamorphosed sediments, supposed to be of the Palæozoic period. The peculiar elastic, flexible sandstone, known as itacolumite, is largely developed, and is the formation which carries the gold.[2] Varieties of this rock are

[1] Vide "The Empire of Brazil at the Paris International Exhibition of 1867." 8vo, Rio de Janeiro, 1867.

[2] According to Mr. C. M. Wetherill the grains of quartz in itacolumite are interlocked so as to form ball and socket joints. (American Journal of Science, xliv, 61.)

known in the country as itabirite and jacotinga, and differ from the itacolumite simply in containing disseminated scales of specular iron. They are also the varieties which are richest in gold. Similar rocks are found in the gold region of South Carolina and Georgia.[1]

ST. JOHN D'EL REY COMPANY.

According to Mr. Hockin some of the principal gold deposits worked by the St. John d'El Rey company are in a clay state, which is most productive where traversed by a compact mixture of quartz and pyrites. These pyrites consist of arsenical, magnetic, and ordinary iron pyrites, with, occasionally, some copper pyrites. Carbonate of lime, dolomite, and brown-spar are also found. When the sulphurets are absent gold is seldom present.

Morro Velho mine.—This mine, belonging to the St. John d'El Rey company, is probably the most productive and profitable gold mine in the world. Its successful working dates from 1842, since which regular dividends have been paid, and the aggregate profits reach the sum of over five millions of dollars, ($5,000,000.) Valuable details regarding this, and other important mines in Brazil, have recently been given by Mr. Hockin, the managing director of the company, and have been published by Mr. J. Arthur Phillips, in his work upon the Mining and Metallurgy of Gold and Silver,[2] from which they are now extracted:

"The St. John d'El Rey Mining Company was first formed in 1830, for working, on lease, the mines of St. Joao d'El Rey and St. José, near the town of the former name, in the southern part of the province of Minas Geraes, in the empire of Brazil. These mines having been found wholly unproductive, were abandoned in 1834, and the company then purchased the Morro Velho mine and estate, situate at Congonhas, near Sabara, a considerable distance (a degree and a half of latitude) north of the locality of their first operations. The Morro Velho mine had been previously worked by native proprietors for more than a century, chiefly by open cuttings, and with varied results.

"At the time of the purchase of the property by the St. John d'El Rey company, the Morro Velho mine was stated to be yielding a profit; but a considerable outlay having been found necessary, in order to extend the operations and increase the resources of the mine, the company, having had to expend large sums in the purchase of stock and erection of buildings, &c., worked at a loss during the first four years of its possession of the estate. In 1839, the returns, under the management of the late Mr. C. Herring, to whose judgment the company is indebted for the selection of the property, again exceeded the outlay; but the original capital having been exhausted by the losses incurred at the St. John d'El Rey mines, and the purchase of the Morro Velho property, it was

[1] Vide the reports of Oscar M. Lieber, the author, and others.

[2] The Mining and Metallurgy of Gold and Silver, by J. Arthur Phillips, mining engineer. London: E. & F. N. Spon, 48 Charing Cross, 1867.

found necessary to apply the greater portion of the proceeds of the gold extracted to the extension of plant, and it was not until 1842 that the first dividend was declared.

"From that date, with the exception of an interval of 18 months on one occasion (1857–8) and 12 months on another, (1864–'5,) during which the working of the most productive portion of the lode was interrupted by a breakage of the pumping and other machinery, the company has regularly paid dividend every six months.

The original subscribed capital of the company was	£135, 000
Out of which there was returned to the proprietors	6, 600
Net paid-up capital	£128, 400
There has been paid in dividends	£756, 245
Laid out in machinery and buildings on the property, out of profits	140, 000
Stores existing on the property of the value of	39, 000
A reserve fund and working capital has been provided, out of profits, to the extent of	72, 249
	£1, 007, 494

"The total value of the precious metals extracted from the mine has been £2,902,480; the total amount of mineral raised, 1,769,050 tons; the average yield of the ore, 4.333 oitavas, or as nearly as possible half an ounce troy, value, about 32*s.* 6*d.*[1]

"The ores from which these results have been obtained, as will be seen by the following figures, have been, on the whole, poor; the yield has been tolerably uniform, the variations that have occurred being attributable rather to the proportion of slate ground with the ore than to any fluctuation in the quality of the lode itself. Improvements have, from time to time, been made in the mode of treatment, and the loss sustained has been, year by year, steadily reduced.

"The average yield of gold per ton, in oitavas, on the whole quantity of stone annually brought to the surface since the year 1847, has been as follows:

Years.	Oitavas.[2]	Years.	Oitavas
1848	3. 77	1857	3. 06
1849	3. 89	1858	3. 25
1850	4. 07	1859	4. 13
1851	3. 89	1860	4. 52
1852	4. 25	1861	5. 44
1853	4. 34	1862	5. 92
1854	4. 17	1863	5. 78
1855	3. 98	1864	4. 82
1856	3. 52	1865	5. 47

[1] The gold obtained at Morro Velho is usually alloyed with about 20 per cent. of silver.

[2] An oitava is 2 dwt., 7.343 gr. troy, or 8.67425 oitavas=1 oz. troy.

"It should be stated, with reference to these figures, that they do not furnish reliable data whereon to form a judgment as to the increasing or diminishing produce of the auriferous formation in depth, inasmuch as, until recently, no account has been kept of the quantity of clay-slate, or other unproductive stone raised from the mines. During the last six years, excluding 1864, during which a large portion of the killas or clay-slate was stamped with the ore, this unproductive stone has been treated separately, and the proportion it bore to the whole quantity of stuff raised has been as follows, viz:

Years.	Per cent.	Years.	Per cent.
1860	18	1863	22
1861	24	1864	—
1862	24	1865	32

"Whether, during previous years, the quantity of this comparatively unproductive stone was in excess, or otherwise, of the foregoing, there is no means of ascertaining. The formation affording the gold is a strong well defined lode, though irregular in direction, dip, and dimensions; its inclination or underlie has also been found to vary at different depths, and in different parts of its extent. The vein stone is mostly composed of quartz with iron pyrites, disseminated, more or less regularly, throughout its mass, and the lode is not unfrequently traversed by clay-slate and barren white quartz. When pyrites are absent in these rocks, gold is seldom present.[1]

"In some places the vein is cavernous, and less close in its texture than in others; but where drusy cavities are frequent the yield of gold diminishes. The most productive matrix for gold is a compact mixture of quartz and pyrites, with varying quantities of slate. The great metalliferous deposit called the Cachoeira, Bahu, and Quebra Panella, is one continuous, very irregular vein, varying in width from 7 to 70 feet, and at one point reaching 100 feet. The average thickness at the present depth, 176 fathoms perpendicular on the Cachoeira and 165 fathoms on the Bahu, is 19 feet. The stoping place extends over 807 square fathoms. There is a north branch, separated from the main deposit by the enclosing rock, called the Gamba, but its working, having been found unprofitable, has been discontinued. The enclosing rock is a clay-slate of tolerably uniform texture. The shafts, so called, for the whole of the lode has been excavated from the surface, are carried down at an inclination of about 45°, and the mineral is brought to the surface by tram carriages of a peculiar construction, carrying large kibbes, containing a ton each. The mineral brought to the surface is first freed from slate and other unproductive stone on the spalling floors, and the ore, after being broken to a uniform size, is stamped fine. The rejected slate and quartz

[1] Arsenical, magnetic, and ordinary iron pyrites predominate at different points, and in varying quantities; carbonate of lime; dolomite, brown spar, and, very rarely, copper pyrites, are also present in the vein.

is removed by tramways to another establishment, half a mile distant, and there employed to assist in the further pulverization of the refuse sand from the first stamping, which is re-stamped.

"The stamping mills, as is also the pumping and other machinery, are moved by water power. The pulverized ore issuing from the stamp coffers, through finely-perforated copper grates, passes over bullock skins, in the first instance, and lower down the inclined tables, over woollen cloths. The bullock skins are taken up and washed in vats every hour, and the woollen cloths at longer intervals. The concentrated sand resulting from washing the bullock skins is subsequently amalgamated in barrels.

"The subjoined table shows the quantities of rock raised and stamped, the amounts of gold produced, and annual net profits made since 1848:

Production of the Morro Velho mine, Brazil, (St. John d'El Rey Mining Company.)

Description.	1849.	1850.	1851.	1852.	1853.	1854.
Stone raised ..... tons..	67, 336	67, 106	79, 810	82, 642	85, 698	86, 048
Stone and ore stamped..... do...	69, 004	64, 313	81, 629	81, 236	86, 866	86, 433
Gold produced ..... lbs. troy..	2, 583	2, 517	3, 057	3, 323	3, 623	3, 464
Net profit	£38, 136	£35, 880	£51, 586	£55, 391	£49, 273	£44, 740
	1855.	1856.	1857.	1858.	1859.	1860.
Stone raised ..... tons..	87, 297	89, 877	86, 407	88, 901	88, 968	91, 361
Stone and ore stamped..... do...	86, 848	87, 424	86, 335	87, 270	82, 880	74, 528
Gold produced ..... lbs. troy..	3, 325	2, 992	2, 539	2, 733	3, 294	3, 974
Net profit	£34, 466	£23, 233	£787	£8, 545	£38, 058	£60, 460
	1861.	1862.	1863.	1864.	1865.	1866.
Stone raised ..... tons..	96, 612	90, 896	84, 758	65, 435	78, 883	107, 087
Stone and ore stamped..... do...	71, 902	67, 508	65, 697	62, 147	59, 607	60, 685
Gold produced..... lbs. troy..	5, 051	5, 182	4, 713	2, 852	4, 153	.....
Net profit	£96, 769	£87, 531	£63, 285	.....	£80, 438	£109, 407
Loss	.....	.....	.....	£14, 629	.....	.....

"Since 1860 the slate and other unproductive stone has been rejected, and the ore only stamped. The clay slate thus separated is crushed in another department of the works. In the above table the profit for that year has been calculated on accounts made up to the end of February, while the other figures given are the result of operations up to the end of December in each year. This company employs upward of 2,400 hands, from 120 to 130 of whom are Europeans. The number of stamp heads at work is 135 for reducing the ore in the first instance, and 56 for re-stamping the residual sand, with slate and quartz; arrastras are also used for re-pulverizing the residual sand, and are found very efficient for that purpose. The work performed by the stamps is given in the following table:

Stamps duty, 1865.

Mills.	Heads.	Blows per minute.	Days working.	Tons of ore stamped.	Tons per day.	Pounds per head per day.
Lyon	30	56	357.46	12,100.6	33.85	2,537
Cotesworth	12	59	356.00	4,932.1	13.85	2,585
Susanna	9	60	361.12	2,897.2	8.02	1,996
Herring	24	77	357.29	11,495.0	31.89	2,976
Powles	36	64	351.24	17,562.6	50.00	3,111
Addison	24	67	353.52	10,619.8	30.04	2,803
Total	135	.....	.....	59,607.3	167.65	

IMPERIAL BRAZILIAN MINING ASSOCIATION.

"This company was formed in 1825, for the purpose of working the Gongo Soco and other mines in the province of Minas Geraes, and in the course of 15 years produced nearly a million sterling. The following is a statement of the financial operations of the Imperial Brazilian Mining Association at Gongo Soco from January 1, 1826, to December 31, 1856:[1]

Receipts—Proceeds of gold dust			£1,467,448
Payments—Salaries and wages	£432,942		
Materials	451,995		
		£884,937	
Provincial duties paid Brazilian government	£310,777		
Export duties ditto	22,403		
		333,180	
			1,218,117
Profits			£249,331

"Gold was discovered at the surface, 122 fathoms above the bottom of the mines, but, owing to the slope of the ground, the deepest shaft was only 56 fathoms in depth; and for the last 8 or 10 fathoms the vein, which had entirely changed its character, afforded only a few particles of gold.[2]

"*Don Pedro North d'El Rey.*—This company was, on the recommendation of Captain Treloar, formed in 1863, for the purpose of purchasing and working the mine of Morro de Santa Anna. This gold mine forms a portion of the celebrated range of mountains called the Sierra de Itacolumi. The mine is about six miles north from Ouro Preto, the capital of the province of Minas Geraes, and two miles west from the cathedral

[1] Communicated by W. J. Henwood, F. R. S.

[2] This mine was ultimately abandoned, about the year 1858, on account of its poverty.

city of Marianna. It is distant from the St. John d'El Rey Company's mine, Morro Velho, about 40 miles in a southerly and easterly direction. The holding or partition of the mining concession in this locality differs from that of similar property generally in Minas Geraes. In 1762 permission was given by the government to open mines in this mountain wherever the miners might feel inclined, and on doing so they became the lawful possessors of fifty palmos of ground on each side of their levels and shafts. Owing to this the mountain is studded with mines, which the owners from time to time went on selling, until, with a few unimportant exceptions, the whole became the property of the present company. At one period upward of 5,000 miners were working on this mountain, and, in order to extract the precious metal, most of them crushed the mineral obtained by hand, and it must therefore have been rich to have repaid them for their trouble.

"*Rossa Grande Gold Mining Company.*—This company was formed in 1864, to work an extensive mineral property called Rossa Grande, in which are said to be several gold mines. The estate is situated in the province of Minas Geraes, in the vicinity of the mine of Morro Velho. The city of Sabara and several villages are within easy walking distances of the property, and the road from Gongo Soco to Sabara and the St. John d'El Rey Company's mines passes through it. It is of great extent, and is estimated to comprise an area exceeding 21 square miles, or over 13,000 acres. The climate is said to be salubrious, and the characteristics of the lodes similar to those of the Morro Velho mine.

"The estate contains three distinct auriferous rock formations, which can be traced for miles, besides a jacotinga formation in the direction of Gongo Soco. Diamonds are said to have been found, and the alluvial deposit in the valley is believed to contain sufficient gold to make it remunerative for working. The first rock formation or upper lode is about six feet wide. It consists chiefly of white quartz and iron, and has yielded from 4 to 40 oitavas, or from half an ounce to five ounces of gold per ton.

"The second rock formation or middle lode varies in size from 6 to 12 feet. It is composed chiefly of quartz and auriferous arsenical pyrites. Lumps of gold have been found in it, and the ore in the swells has sometimes afforded 50 oitavas, or upwards of six ounces of gold per ton. The third or lower rock formation is of greater magnitude than the other two, being about 36 feet wide. Its composition is mainly quartz and brown oxide of iron. The whole mass of this lode is said to be auriferous, and portions of it have yielded 50 oitavas of gold per ton. The mine has not yet produced any considerable amount of gold. The greater portion of the time which has elapsed since the formation of the company has been occupied in clearing out the old workings and the erection of machinery.

"*East d'El Rey Company.*—The Morro Sao Vicente mine, worked by this company since 1863, is situated about 24 miles eastward of the Morro Velho mine, and about 22 miles from Ouro Preto, the capital of the prov-

ince of Minas. The highway to the latter from the interior passes through the estate, and the distance from the Emily mines formerly worked by this company is about 17 miles. The estate contains several lodes, but the Champion lode is considered to be more important than the others. The mine is on this lode, which runs obliquely to the clearage planes of the containing rock, its course being south 50° east, and underlies north, at an angle of 45°. This vein belongs to the class of auriferous rock formations. It chiefly consists of quartz, pyrites, galena, tellurium, and gold. It can be traced for some miles, and its width varies from 12 to 30 feet. The rich shutes dip eastward at an angle of 40. The containing rock is clay slate. The mine is situated in a deep hollow, near the western boundary of the property, and consequently does not admit of drainage by an adit; pumping machinery, therefore, is used for this purpose. The excavation has gone down at a less slope than the dip of the lode, and, consequently, it has passed from one layer of the vein into another above it, and, since the returns of gold have been much higher in some months than during others, it follows that they vary in richness; yet, on the whole, the mine has been generally found to improve in descending. Its present depth is about 100 fathoms. This property has, until very recently, made regular returns of gold, but having, in common with other mines in the district, suffered much from want of workmen, who, in consequence of the war in which Brazil is now engaged, have been drafted for military service, it has been obliged temporarily to suspend operations.

"The value of the gold remitted to England during the time the Emily mine was being worked by this company amounted to £5,306 15*s.* 5*d.*

"From the Morro Sao Vicente:

	£	*s.*	*d.*
In 1864	2,852	7	4
1865, to May, 1866	8,588	17	6
Total	11,441	4	10

CHILI.

Chili has long been known to be a gold-producing country, and Humboldt estimates its yearly product in 1800 at 7,500 pounds troy. According to M. Domeyko in his notes upon the mineral richness of the country, accompanying the ores sent by the Chilian government to the Expo-

ion, it is impossible to judge of the production of the gold mines of

ili except by the quantity of the metal coined at the Santiago mint. This, in 1865, amounted to $485,158, and in 1866 to $696,035. To this may be added 33,389 grams (1,071 ounces) of gold exported in bars in 1865, from which is to be subtracted the value of gold from Peru and the Argentine provinces, valued at $61,510, thus reducing the amount for 1865 to about $442,929.

In the mineral collection made in Chili by Lieutenant J. M. Gillis, there

were specimens of gold-bearing quartz exhibiting all the usual characteristics. In the descriptive notice of this collection[1] it is observed that the metal is found in veins traversing granite. It is associated with iron or copper pyrites, arsenical pyrites, blende, galena, and sulphuret of antimony. Mention has been made by M. Crosiner of gold deposits in the midst of decomposed granite and red clay, which do not appear to have been formed by the decomposition of regular veins. This can be seen near Valparaiso. Similar deposits are noticed as occurring in the elevated parts of mountains. The most extensive deposits of gold are on the flanks of the Andes, about 40 miles east of Chillan.

The gold mines of Chili were represented at the Exposition by a series of specimens, Nos. 261 to 265. It is stated in connection with these that in addition to the numerous basins of auriferous alluvions found throughout Chili, there are also veins and metalliferous masses containing gold in all the granitic and crystalline rock formations of the coast and of the interior of the chain of the Andes. Most of the old gold mines which were worked during the domination of Spain are now abandoned, for the reason that the mines of copper, of silver, and of coal are more attractive and profitable to the miners.[2] The following is a description of some of the specimens:

Mine Toro, Coquimbo.—No. 261.—Two large blocks of gold-bearing quartz containing pyrites and a black blende (marmatite,) which is a common associate of gold in Chili. This ore is abundant in the vein of the mine known as Toro, near Andacolle, Coquimbo. In the vicinity of this mine there are extensive placers, which have been worked since before the discovery of America.

At Andacolle there is an extensive metalliferous deposit composed of ore similar to that found at Toro.

No. 262.—Specimens of ore similar to the above but containing cinnabar, which is found in many localities in Chili associated with gold.

Los Remolinos, Department of Copiapo.—Nos. 263, 264.—Two specimens of copper ore, very rich in gold and containing visible gold. These mines also produce native copper and oxide of copper.

Mine Cachiyuyo.—Specimen No. 264, *bis.* Native gold in the sulphuret of copper from this mine.

Mine Castillo de Tiltil, Province of Santiago.—Native gold (No. 265.)

ARGENTINE REPUBLIC.

The mineral regions of this republic are in the Andes adjoining those of Chili. Gold is obtained in the provinces of Mendoza, Rioja, Tontal, and San Juan. The mine El Morada is said to yield ten ounces to the

[1] United States Naval Astronomical Expedition, &c., Appendix D, Minerals and Mineral Waters of Chili, by Prof. J. Lawrence Smith.

[2] Notice Statistique sur le Chili et Catalogue des Mineraux Envoyes a l'Exposition Universelle: Paris, 1867.

ton of ore.[1] There are no satisfactory statistics of the total production, which is probably quite limited, and the metal finds its way, for the most part, into Chili.

URUGUAY.

The statistical and historical notice of the republic of Uruguay circulated at the Exposition states that the departments of the country adjoining Brazil are rich in veins of silver and gold. The auriferous quartz is said to give large masses of the metal. Placers are found and worked upon the streams that descend from the mountains, but the superior attractions of stock-raising have prevented their full exploration. There are mines of argentiferous lead, and considerable quantities of fine agates are exported to Europe.

BOLIVIA.

The gold washings of Romanplaza were represented at the Exposition, but no statistics or other information could be obtained. Gold was formerly produced at Atacama, on the Pacific side of the Andes, and Lieutenant Gibbon cites several localities where gold is, or has been, obtained. The coinage of gold at the mint of Potosi amounted to $11,984 in 1849. According to Phillips, gold washing is carried on with profit at the sources of the Rio Grande, and at Tipoani, near Sorata, at Yungas, and in other localities. The total annual produce is estimated at about 1,600 pounds Troy; value, about $300,000.

PERU.

The Peruvian Andes are rich in gold, which is found in nearly all the rivers. The placers of the river Chuquiaguillo are rich, and have been worked from a remote period. According to Forbes, these deposits appear to have been formed of the debris of Silurian rocks.[2]

Lieutenant Gibbon describes gold mines at Carabanya, on the northeast side of the mountains, where the tributaries of the Madre de Dios take their rise. The metal occurs in quartz or mingled with black dust in a vein, and also in placer deposits. One of the placers worked from May to December, in 1851, yielded 125 pounds of gold. The total annual production of Peru is believed to be about 2,400 pounds Troy; about $500,000 in value.

VENEZUELA.

Mr. Eugene Thirion, consul of Venezuela, exhibited some interesting rich gold-bearing quartz from the mines of Caratal, worked by Messrs. Battistini and Trustuck, of the city of Bolivia.

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[1] La Republique Argentine, rapport adressé au gouvernment de S. M. Britannique, par M. Francis Clare Ford, Secretaire de la legation Brttannique: Paris, 1867, p. 52.

[2] Report on the Geology of South America, by David Forbes, F. R. S. Communicated to the Geological Society of London, November 21, 1860. Cited by J. A. Phillips, p. 89.

NEW GRANADA.

Boussingault, Chevalier, and others have given descriptions of the mines of New Granada, but there are no very recent connected statistics of the total production. A correspondent of the New York Tribune, writing under date of May 20, 1868, states that mining is receiving much attention from the people of Antioquia; that much capital is invested in the mines, and that the yield of the precious metals is considerable, reaching, in the month of March, 1868, $132,144 in gold, and $16,075 in silver; a total of $148,219. At this rate the total production of gold per annum would be over $1,500,000, and of silver nearly $193,000. We, however, have no means of knowing whether the monthly production is constant or nearly so.

Mr. Phillips, in his recent work, describes the principal gold-washings as situated in the provinces of Antioquia and Veraguas, "in the former of which the detritus of all the rivers is said to be auriferous; and some quartz veins, occurring in granite and containing iron pyrites, are worked on a limited scale. The principal mines of gold quartz worked in 1850 were on the river Porce, the veins resembling, in every respect, the quartz lodes of other auriferous regions, and containing a considerable amount of iron pyrites and other sulphides." "Quartz veins are also numerous in the provinces of Panama and Veraguas, but the amount of gold contained in them is usually small." Chevalier estimated the yield of the province of Antioquia for the year 1847–'48, at 12,500 pounds. Mr. Danson,[1] from information based on the returns of the British consuls, estimates the total amount produced from 1804 to 1848 at £40,817,066.

Reports of discoveries of new and rich placers in 1865–'66 caused quite an immigration there of miners from California, but the tenure of lands, the climate, and dense growth of vegetation were found so unfavorable to mining that those who were not struck down with the fever of the country left thoroughly disappointed.

MARIQUITA AND NEW GRANADA MINING COMPANY.[2]

"The most important gold mines belonging to British capitalists, now worked in New Granada, are those of Marmato, which are situated in the province of Antioquia. Previous to 1852 these mines were worked by an independent company, but in that year the above association was formed for the double purpose of working the Marmato gold mine and the Santa Ana silver mine, both in New Granada. At the time of their purchase by the present proprietors the mines of Marmato were provided with 12 stamping mills, representing, in the aggregate, 110 heads, which, during the year 1851, had crushed 12,488 tons of stuff, yielding on an average 11 pennyweights 11 grains of fine gold per ton, and resulting in a net profit of £8,343 6*s.* 8*d.* The Marmato mines are worked on deposits of

[1] Journal Statistical Society, London, xiv, 40.

[2] From Phillips's Metallurgy of Gold and Silver.

auriferous pyrites, usually yielding a little more than half an ounce of gold per ton. The quantity of ore raised during the year ending March, 1853, was 15,056 tons, and the quantity stamped 19,089 tons; the total produce being, gold, 10,711 ounces; silver, 5,988 ounces; leaving a profit of £1,144 10*s.* 2*d.*

"During the financial year ending March, 1854, the ores raised amounted to 17,372 tons, and the quantity stamped to 18,225 tons, yielding gold, 10,170 ounces; silver, 5,895 ounces; and resulting in a net profit of £9,767 13*s.* 9*d.* From March, 1854, to 1855, the ore raised amounted to 14,154 tons, and the ores stamped to 18,288 tons, which produced 6,608 ounces of fine gold, and 4,193 ounces of silver; the profit for the year being £3,932 5*s.* 7*d.* In the following year the ores raised amounted to 15,966 tons, and the quantity stamped to 17,668 tons, yielding 6,408 ounces fine gold, and 4,193 ounces of silver, and leaving a profit of £555 14*s.* 2*d.* on the operations of the 12 months. During the year ending March, 1857, the ore stamped amounted to 19,370 tons, yielding 5,635 ounces of gold, and 3,353 ounces of silver obtained, but resulting in a profit of only £541 0*s.* 8*d.*, as a large amount of machinery was erected in the course of this year. In 1859 the profits were £6,918 12*s.* 5*d.*, the stuff crushed 19,598 tons, the gold obtained 6,476 ounces, and the silver 3,874 ounces. The profits in 1860 amounted to £2,778 8*s.* 4*d.*, but we have no data relative to the amount of ore treated, &c. For the year ending March, 1861, the profit was £1,083 18*s.* 5*d.*; the number of tons crushed, 19,431; the yield of gold, 5,039 ounces; and of silver, 3,150 ounces. From the 28th of February, 1861, to the 24th of January, 1862, the operations of the mines were much interfered with by the revolutionary war; only 16,859 tons of rock were crushed, and 2,592 ounces of gold, and 1,663 ounces of silver obtained. The loss on the operations of this year amounted £2,745 15*s.* 9*d.*, and they were afterwards for some time almost suspended.

"After the termination of the revolutionary movement the works were again resumed, and between March 31, 1864, and March 31, 1865, 10,283 tons of stuff were crushed, and about 3,000 ounces of gold, and 1,800 ounces of silver obtained, but the returns were not sufficient to meet the outlay. The Marmato property is at the present time being worked at a profit, and the company has recently acquired the Aguacatal mines, in the immediate neighborhood, from which satisfactory results are anticipated."

CENTRAL AMERICA.

A small quantity of gold is annually produced in the republics of Nicaragua, Honduras, Costa Rica, and San Salvador. In 1852 there was a small mint in Costa Rica, which coined from $50,000 to $100,000 annually, principally in dollar pieces of gold. From a report made by the master of the old mint in 1825 it appears that in the 15 years before 1810 gold and and silver had been coined to the amount of $3,810,382, and he

estimated the actual product of the mines at ten times the amount coined, but that, probably, is too high an estimate.[1] Dunlap observes that the ores of Honduras generally contain from 12 to 15 per cent. of silver, and from 1 to 1½ per cent. of gold. The latter metal is also obtained in the river deposits by the Indians, pieces weighing five or six pounds having occasionally been discovered.

Rich gold washings are reported by the same author at Matagalpa, near Segovia, in Nicaragua. They are also worked by Indians, who annually collect and sell a few pounds.

In the mining district of Chontales, Nicaragua, there are some gold-bearing veins, recently noticed by Commander Pim, royal navy.[2] This district is about midway between Lake Nicaragua and the Caribbean sea, and commences in the town of Libertad, in the mountain range, nearly parallel with Lake Nicaragua. It is several miles wide, but is comparatively little known. There are probably two gold-bearing veins, nearly parallel and trending northeasterly and southwesterly. The mine Jarali, on the river of that name, has been worked to a depth of 150 feet, upon a ridge which may be drained by tunnels. It is assumed to have an average width of three yards, and that it will yield an ounce per ton.

"In the mountain of Aguacate, in Costa Rica, several gold mines were worked with fair profits."[3] (1847.)

CUBA AND SAN DOMINGO.

The committee of agriculture, industry, and commerce, of Remedios, Cuba, exhibited specimens of ores of gold from the mine San Blas, in the district of Guaracabuya, and from San Atanasio, a league and a half distant from San Blas.

These veins are described as occurring at many places in the district, and some have been explored to a depth of 60 feet and a length of 300 feet. The gold is found in extremely small scales or points between the layers of dioritic rock or slates and of serpentine. It is associated with iron pyrites and arsenical pyrites, and occasionally with tellurium. The vein of San Atanasio varies from three centimetres to 21 centimetres in thickness. In both of these localities there are traces of ancient work by the aborigines.

Gold placers of considerable extent are known to exist in San Domingo, but they were not represented at the Exposition.

AUSTRALIA.

The gold of the Australian continent was represented in the Exposition by a variety of specimens of the quartz lodes, or reefs, specimens of the

[1] Vide Nicaragua, People, Scenery, Monuments, &c., by E. G. Squier; Introduction, p. 40.

[2] The Chontales mining district, Nicaragua, by Commander Bedford Pim, royal navy. paper read at Dundee, September 7, 1867, before the British Association for the Advancement of Science. Published in the Mining Journal, September 14, 1867.

[3] Dunlap's Central America, pp. 227 to 284.

native gold, models of the large nuggets, and several series illustrative of the character of the gravel deposits or placers. These, and the veins, were still further illustrated by geological maps and sections, and by descriptive and statistical publications.

Among these objects we noted the model of the celebrated "Welcome nugget," which was found in June, 1858, at the diggings of the Red Hill Mining Company's claim, Pakery Hill, Ballarat. This weighed 2,217 ounces, 16 pennyweights, and was valued at nearly £10,000. But the most prominent object was a tall gilded pyramid representing the aggregate bulk of gold obtained in the Colony of Victoria from October, 1851, to October, 1866, a period of 15 years. This pyramid was 10 feet square at the base and 62 feet 5½ inches high. Its bulk in cubic feet was 2,081½, and it represented a value of £146,057,444 sterling, about $730,000,000. It was made of carpentry in sections, fitting one upon another; the outside covered with stout canvas, upon which gravel and grains of sand or broken plaster were glued and then gilded over so as to imitate the appearance of a pile of gold nuggets and dust as it comes from the mines.

VICTORIA.

This colony is situated at the southeast of the continent of Australia, and lies between the 34th and 39th parallels of south latitude and the 141st and 150th meridians of east longitude. Its extreme length from east to west is about 420 miles, and its greatest breadth about 260 miles. Its extent of coast line is nearly 600 miles. It is often mistaken by writers for the adjoining colony, known as South Australia. Its area is 86,831 square miles, being nearly as large as that of Great Britain.

This colony has produced more gold than any other division of Australia. The metal was first discovered at Clunes in March, 1850, and licenses to dig were first issued in 1851. The actual area now mined upon as stated in the "Mineral Statistics of Victoria," 1865, is $725\frac{11}{21}$ square miles, and the estimated number of quartz veins known is 2,029. "These veins traversing lower palæozoic strata and associated with granitic and igneous rocks are, so far as is at present known, the primary source of the whole of the gold raised in Victoria. The thickest and most persistent veins, or 'lines of reef,' are found on the lower or older portions of the series; but the average yield of gold per ton of stone has, I believe, been greater from the thinner veins of the upper beds."[1] These veins are described as "dikes or reefs," and are from the thickness of a thread to 130 feet. They generally have a meridional direction and are inclined at all angles either to the east or west; are often vertical, and sometimes horizontal. Occasionally they coincide with the planes of stratification, but they usually follow the cleavage planes or joints, and often they intersect all.

[1] From Notes on the Physical Geography, Geology, and Mineralogy of Victoria, by Alfred C. Selwyn, Director of the Geological Survey: Melbourne, 1866.

The greatest depth to which any vein has been worked in Victoria was 630 feet, (1866,) at the Victoria company's mine, Clunes. At the depth of 444 feet in the Port Phillip company's mine one ounce of gold per ton has been obtained, and the experience in Australia, as in California, shows that veins do not grow poorer in depth.

The heaviest nugget or connected mass of gold known to have been found in a quartz reef in the Colony weighed nearly 13 pounds, and came from a depth of 40 feet from the surface at Old Quartz Hill, Castelmaine. Gold has been observed in sandstone, as at Prior's reef, Castelmaine, and in diorite,[1] and limestone.

In the specimens at the Exposition illustrating the character of the auriferous reefs of the colony, there were some which resembled the Nova Scotia gold quartz more than the California. The gold has a higher color, and is finer than that from California. One of the specimens (No. 186) resembled the quartz of Grass Valley. Another contained a large amount of sulphuret of antimony in close association with the free gold. In regard to the fineness of Victorian gold, Mr. Ulrich observes that it ranges between 20 and 23.5 carats, the Ballarat gold being of the highest standard. From only one district, Lake Omeo, is the standard reported as below 16 carats, and the alloy is copper, with a trace of silver.

Mr. Selwyn has arrived at the conclusion that there are at least two distinct sets of quartz veins in Australia, one of which is quite barren, and has never yielded any gold to the miners or to the ancient streams and placers. He regards the veins as having been formed at two different and remote periods, the barren set being the oldest, formed before the Miocene or Middle Tertiary period, and the productive ones during the Miocene period, or anterior to the distribution of Pliocene gravels, which are found to contain gold, while the older drifts do not contain it. In further support of his conclusion that there are two sets of quartz veins, he mentions a fact well known to experienced quartz miners and prospectors in Australia, that in many districts there are quartz ledges that are entirely barren, in close proximity to those that give handsome returns. This fact is a familiar one also to American quartz miners, not only in California, but in the Appalachian gold field, and it suggests the probability of there being quartz lodes of two or more distinct periods in America as in Australia.

AUSTRALIAN PLACERS.

By far the largest portion of gold obtained in Australia is from gravel deposits or placers like those in California. They are either in the beds of existing streams, or in terraces along the banks, or in ancient channels running transversely to the existing drainage of the country. Many of the richest deposits are found under heavy accumulations of stratified tuffs and lavas, with layers of basalt on the top forming table mountains, as in California. There is a great difference in the thickness of these

[1] Ulrich, Geology and Mineralogy of Victoria, p. 41.

placer deposits in different places. In some that are not covered by basalt they have been found to be from 130 to 140 feet thick, and in one instance a shaft has been sunk to a depth of more than 400 feet, passing from top to bottom through a conglomerate formed of water-worn pebbles and blue clay, and had not reached the bed-rock in 1865.

Of the age of these deposits Mr. Selwyn observes as follows: "The exact period in the Tertiary epoch, where the gold drifts commenced, is at present exceedingly doubtful. No beds are yet known in Victoria associated with, or forming a portion of such drifts, that contain fossil marine animals. Neither has any gold been obtained from beds below the known fossiliferous Tertiary strata. The volcanic rocks, consisting chiefly of varieties of trachytic dolerites, basalts, trachytic porphyries, &c., are in many districts inter-stratified, in contemporaneous layers, with the sands, clays, and gravels, of what are at present considered to be the oldest gold drifts, in which the lowest stratum, where the gold occurs, almost invariably consists of a water-worn quartz gravel. That there are gold drifts marking at least three distinct deposits, the results of successive upheavals and depressions, is quite certain; and it is now almost equally certain that the earliest of them was the result of the commencement of the oldest pliocene period. In accordance with this view they have been divided into older Pliocene, newer Pliocene, and post Pliocene deposits. These three stages sometimes occur in the same locality without the intervention of any volcanic rocks, in which case three bottoms or gold-bearing strata are found in one shaft, the last being always on the solid, unmoved Palæozoic rock. About 400 feet is the greatest known thickness of these older Pliocene deposits, including the associated volcanic rocks, and at this depth rich deposits of gold are found in them resting on the slopes, and in the hollows of what was once the old Pliocene sea-bed. The exact relations of the gold-bearing drifts of the upper Tertiary periods to the marine Tertiary sands, clays, and limestones of the Miocene and Eocene series, is a very interesting point in Victorian geology not yet elucidated, and one which may have an important bearing on the probable extension of the deep gold leads of Ballarat and other gold fields.

"In following the leads they are invariably found to deepen in the general direction of the existing surface water-shed. Thus, at Ballarat and other gold fields on the south side of the dividing range, they deepen in a southerly direction; while at Clunes, Bendigo, &c., they invariably deepen in the opposite or northerly direction, and there seems no reason why they should not extend underneath a very large part of the extensive plains that stretch from the northern gold fields to the Murray, and from the southern flank of the dividing range to the seaboard, wherever the tertiary rocks forming these plains rest directly on the lower palæozoic strata."

There appears however to be some doubt whether gold may not be, or has not in reality been, found in some of the deposits considered as

Miocene, for it appears by an observation of Rev. W. B. Clarke, in his paper upon the sedimentary formations of New South Wales, accompanying the exhibits of that colony in the Exposition,[1] that gold has been discovered in the so-called Miocene deposits of Victoria. Mr. R. B. Smyth, in his Intercolonial Exhibition essay, cites the fact that rich quartz has been obtained from great depths in these Miocene deposits, and this may possibly be the gold that Mr. Clarke refers to, but it will be seen at once that quartz veins may be found in the Miocene Tertiaries, without affecting the conclusion of Mr. Selwyn in regard to the barrenness of Miocene drifts.

The regions of Ballarat and Bendigo have been the most productive. Ballarat is the centre of the gold districts of Clunes, Creswick, Smythe's, Egerton, Gordon, Steiglitz, Linton's, Carnham, &c. Bendigo, the most important gold field of the Sandhurst district, was originally a shallow gold field, some of its famous gulleys yielding many ounces to the tub having been scarcely a yard in depth. In place of these placer diggings, now nearly or quite exhausted, the chief industry of Bendigo is quartz mining, which extends over an area of some 40 square miles.[2]

The attention of the geological survey of Victoria has latterly been directed to the very important question of the age and probable auriferous or non-auriferous character of what are called "the lower drifts of Victoria," and from the facts observed the following conclusions have been arrived at:[3]

"1. That these particular drifts are clearly antecedent in date to the upper and middle Miocene beds, under which they have now been traced, and, therefore, that they are far older than the lowest Pliocene gravels, to which age the "deep-lead" gravels of Bellarat, the White hills of Bendigo, and other similar rich gold-bearing gravels have been referred.

"2. That they do not probably contain gold in paying quantity, the reason being that they are derived from the abrasion of quartz veins that themselves contained little or no gold, and that were probably formed by forces in operation as long prior to those which produced the gold-bearing veins, as the denudations producing the barren Miocene gravels were prior to those which gave rise to the Pliocene productive ones.

"I will now briefly state the facts which have led to these conclusions:

"During the progress of the geological survey, deposits from a mere capping to over 300 feet thick have been met with in several localities, from sea level to an elevation of 4,000 feet. These consist of beds of clay, sand, cement or conglomerate, gravel, and large boulders, the gravel and boulders much water-worn and rounded, and composed either of quartz, quartz rock, or hard silicious sandstone. They rest on

[1] Catalogue of the Industrial Products of New South Wales, forwarded to the Paris Universal Exhibition of 1867. Printed by authority of the government commissioners. 8vo.

[2] Phillips. Mining and Metallurgy of Gold and Silver, p. 112.

[3] These were published as a parliamentary paper, 8th May, 1866, and are republished by r. Selwyn in his "Notes on the Physical Geography, Geology, and Mineralogy of Victoria," elbourne, 1866, and distributed at the Paris Exhibition. See pp. 21, 22.

the ordinary slates and sandstones (Silurian) of the gold fields, and are often in the vicinity of rich gold-bearing quartz reefs.

"Till quite recently I have considered these deposits to be true older Pliocene gold-drifts, or of the same age as the rich lower drifts of Bendigo, Epsom, Ballarat, Castlemaine, and other gold fields, all of which drifts they very closely resemble both in lithological character and geological position. Holding this position, I have hitherto been at a loss to explain why they had in no instance been found to contain gold in paying quantity. Numerous shafts had been sunk, and levels driven in them in the most likely places, in various localities, both by miners and by the geological survey parties, with a view to develop their supposed auriferous contents, but always with the same unsuccessful result."

PRODUCTION AND EXPORT OF GOLD IN VICTORIA.

The following statistics of the production and movement of Victorian gold are taken from the essay of Mr. Archer, circulated at the Exposition:[1]

"The exports of gold, the produce of Victoria, in 1865, amounted to 1,543,149 ounces. This quantity was about 2,249 ounces short of that in 1864. The total quantity of Victorian gold which passed through the customs of this and the adjacent colonies since the first opening of the gold fields amounts to 32,272,793 ounces, representing, at £4 per ounce, a value of £139,091,172. The following are the quantities exported in each year:

Net exports of Victorian gold from 1851 *to* 1865, *inclusive.*

Year.	Quantity.			Year.	Quantity.		
	Oz.	*dwt.*	*gr.*		*Oz.*	*dwt.*	*gr.*
1851	145,137	3	12	1860	2,156,660	13	
1852	2,738,484	0	13	1861	1,967,413	11	
1853	3,150,020	14	16	1862	1,658,241	17	
1854	2,392,065	9	19	1863	1,627,066	7	
1855	2,793,065	8	16	1864	1,545,398	3	
1856	2,965,695	17	0	1865	1,543,148	19	
1857	2,761,528	8	0				
1858	2,528,187	19	12	Total	32,273,792	13	
1859	2,280,678	3	0				

"In addition to the above there were probably 150,000 ounces lodged in the Victorian treasury, and in the hands of the colonial banks and gold brokers, at the end of 1865. It was estimated some years ago by one of the principal Melbourne gold-brokers, who had every opportunity of being well informed on the subject, that from the first discovery of gold to the end of 1859, 1,931,869 ounces had been taken out of the colony by private hands, without being passed through the customs. This es-

[1] The Progress of Victoria: a Statistical Essay by William Henry Archer, Registrar General of Victoria, &c., &c. Melbourne, 1867.

mate brought down to the end of 1865, in the same proportion as the gold appearing in the customs returns, would make the total quantity of unrecorded gold taken out of the colony from the commencement to that date equal to 2,863,247 ounces, which being added to that which passed through the customs, and that in possession of the treasury, banks, &c., would make the total produce of the Victorian gold fields to the end of 1865, amount to 35,286,040 ounces, which, at £4 per ounce, would represent a value of £141,144,160."

To this may be added the production for the years 1866 and 1867, the first being stated approximately in the mineral statistics of Victoria for the year 1866 as 1,479,194¾ ounces: value at £4 per ounce £5,916,777, or about $29,583,885.

Later returns received since the foregoing was written state the yield of Victorian gold for 1866 as 1,480,597 ounces, and for 1867, 1,392,536 ounces,[1] and for other years as follows, differing slightly, as will be seen, from the amount given for corresponding years in the preceding table:

Year.	Ounces.	Value at £4 per ounce.
1863	1,[illegible]	[illegible]
1864	1,[illegible]	[illegible]
1865	1,[illegible]	[illegible]
1866	1,[illegible]	[illegible]
1867	1,[illegible]	[illegible]

By adding the value of the production for 1866 and 1867 to the above amount of the total value up to 1866, viz., £141,144,160, we have $[illegible],000,000, approximately the total production of Victoria to the present time.

The gradual diminution in the export since 1862 will be observed. A writer in Dicker's Mining Record says:

"It has been the custom to attribute this falling off in the yield of the gold-fields to a decrease in the number of miners, who, for various reasons, have embarked in other pursuits, and permanently forsaken the gold-fields. The returns of the number of miners employed throughout the year would seem to bear out this view. In 1865 the number of miners employed throughout the year was 83,211; in 1866, [illegible], and in 1867, 65,857; a reduction as between 1865 and 1867 of [illegible] miners. The decrease has been alike gradual among miners employed in alluvial and quartz workings. In 1865 the number of alluvial miners was 65,885; in 1866, 55,916; and in 1867, 51,719. The number of quartz miners in 1865 was 17,326; in 1866, 14,878; and in 1867, 14,144. Whether the reduction will prove continuous is a matter for conjecture. The spirit of speculation in regard to mining adventures indicates that capital is forthcoming whenever there is legitimate occasion for its use, and recent events at Ballarat tend to encourage the belief that there is yet an almost inexhaustible treasure remaining in the soil. The decrease in

[1] Extract from Dicker's Mining Record, published in the American Journal of Mining.

the yield of gold has not been proportionately greater than the decrease in the number of miners, and their wages have consequently improved yearly. In 1860 the average annual earnings per man were, in round numbers, £79; 1861, £74; 1862, £67; 1863, £70; 1864, £74; 1865, £74; 1866, £80; and 1867, £80."

According to the mineral statistics of Victoria for 1866, the ratio of vein gold from quartz mines to the placer gold was as follows:

From quartz veins	521,017 ounces.
From placers	958,177¾ "

The number of quartz miners employed in the different districts was as follows:

Ballarat	2,005
Beechworth	2,941
Sandhurst	1,118
Maryborough	2,292
Castlemaine	2,643
Ararat	874
Total	14,873

Although the returns for 1866 of the yield of gold from the quartz veins do not include all the mines of the different districts, they are very complete and instructive, and give accurate information relative to an aggregate amount of 861,468 13-20 tons, which yielded 452,895 ounces 7 pennyweights, or an average of 10 pennyweights 16.2 grains per ton.

Mining districts.	Tons crushed.	Total product.		Yield per ton.	
		oz.	*dwt.*	oz.	dwt.
Ballarat	238,503¼	58,157	3	4	11
Beechworth	130,519 11-20	118,495	19	18	3.7
Sandhurst	244,807¼	118,743	10	9	14.8
Maryborough	79,552 3-5	44,967	14	11	7.3
Castlemaine	124,374¼	85,662	3	13	18.5
Ararat	43,711	33,868	18	15	11.6
Totals	861,468 13-20	459,895	7	10	16.2

The prices paid for working quartz ranged from 4*s.* to £1 10*s.* per ton. The number of steam-engines in operation during 1866 was: Alluvial mining engines, 480; aggregate horse-power, 9,981. Quartz mining engines, 510; aggregate horse-power, 9,231. Number of stamp heads 5,437. In 1865, according to Mr. Archer, "the machines used in gold mining, at the end of 1865, numbered 6,337, representing an approximate total value of £1,773,271. The number of steam-engines working was 964, of which 473 were employed in alluvial and 491 in quartz mining. The aggregate horse-power of the former was 8,208; that of the latter was 8,606, making a total of 16,814. The following machines were in

in alluvial mining: 3,228 puddling machines, 427 whims and pulleys, 115 whips, 78 horse-pumps, 648 sluices and toms, (having 4,428 sluice-boxes,) 196 water-wheels, 33 hydraulic hoses, 102 pumps, 8 derricks, 25 crushing machines, (having 461 stamp heads,) and 4 boring machines. The following machines were used in quartz mining: 99 crushing machines, (having 5,119 stamp heads,) 231 whims and pulleys, 56 water-wheels, 15 derricks, 98 whips, and 10 quicksilver cradles."

Some further details regarding the number of machines in use, and the average yield of the quartz of different districts, are cited by Mr. Phillips from the surveyor's reports for 1860. It appears that in that year 61,075 tons of quartz from the Ballarat district yielded 38,378 ounces 6 pennyweights of gold, or an average of 12 pennyweights 13 grains per ton.

From the Beechworth mines 3,725 tons 16 hundred weights of quartz gave 13,862 ounces 6 pennyweights of gold, = 3 ounces 14 pennyweights 10 grains per ton.

The Sandhurst district afforded 2,578 tons 15 hundred weights of quartz, yielding 6,361 ounces 8 pennyweights of gold, = 2 ounces 7 pennyweights 12 grains per ton.

From the Maryborough district there were crushed 4,548 tons, producing 6,345 ounces 1 pennyweight of gold, = 1 ounce 7 pennyweights 21 grains per ton.

The district of Castlemaine produced 13,301 tons 15 hundred weights, affording 14,955 ounces 11 pennyweights of gold, = 1 ounce 2 pennyweights 11 grains per ton.

Ararat yielded 1,265 tons 10 hundred weights of quartz, which gave 2,002 ounces 10 pennyweights of gold, = 1 ounce 11 pennyweights 15 grains per ton.

In the same year there were 294 steam-engines, of the aggregate horse-power of 4,137, employed in alluvial mining, and 417 engines, of the aggregate power of 6,645, employed in quartz mining. There were, in addition, 138 water-wheels and 3,958 horse-puddling machines in operation. The total approximate value of the mining plant in the colony was, at the same period, estimated at £1,299,303.

CLUNES AND OTHER GOLD MINES—VICTORIA.

The following special descriptions of the Clunes and other important Victorian mines are extracted from the work of Mr. Phillips, p. 114, and are, in part, cited by him from Dicker's Mining Record:

CLUNES.—*Port Phillip and Colonial Gold Mining Company.*—This is the most important and extensive quartz-mining enterprise in the colony. The extent of the claim is 160 acres, held on a lease for 21 years, from 1st January, 1857, at a royalty of seven and a half per cent. on the gross value of the gold raised. Operations were commenced by the present company in 1857, and in the following year Mr. Selwyn, the government geologist, thus writes of its mines and establishments:

"Within the last 12 months I have visited all the principal quartz reefs and crushing establishments on the northern and western gold fields, and the Port Phillip and Colonial and Clunes company is the only one I have seen of which it would be possible to say that it leaves little to be desired, either as regards the system of working the mine, or the general arrangement and management of the machinery."

The reefs worked are five in number, and are enclosed in a soft white and brown slaty sandstone, which, like the veins themselves, runs nearly north and south, and generally dips toward the east. With the exception of the overlying tabular basalt, no igneous rocks occur on the surface within three miles of these veins. The nearest granite is at Mount Beckworth, nine miles west of the company's property. Nearly three-fourths of the land held by the company is occupied on the surface by a stratum of tabular basalt, and it is only in the southwestern corner, where this rock has been removed by denudation, that the shales and sandstones, with their associated quartz veins, come to the surface.

The greatest depth to which the Clunes has been worked is 485 feet, and the total amount of quartz treated since the commencement of operations in 1857, to October, 1866, has been 319,695 tons, yielding 185,488 ounces 8 grains of gold, giving an average produce of 11 pennyweights 14½ grains per ton. Mr. C. H. Fielder, the secretary of the company, furnished the information embodied in the following tables:

Return of quartz crushed from June, 1857, to October, 1866.

Period.	Quartz crushed.	Net amount of gold produced.	Average per ton.	Royalty.	Total.
	Tons.	*Oz. dwt. gr.*	*Oz. dwt. gr.*	£ s. d.	£ s. d.
1857, (seven months)	4,146½	6,780 14 8	1 12 17	2,650 11 1	26,764 4 6
1858, (nine months)	11,320½	15,764 9 0	1 7 20	6,130 2 2	61,301 3 5
1858–'59, (one year)	17,542	18,165 12 12	1 0 17	6,202 15 8	71,497 4 5
1859–'60, (one year)	21,694	17,466 16 9	0 16 0	5,135 14 4	68,476 5 6
1860–'61, (one year)	32,258	24,326 6 3	0 15 2	7,178 3 2	95,708 13 5
1861–'62, (one year)	34,236	22,012 0 17	0 12 20	6,479 18 4	86,398 12 11
1862–'63, (one year)	40,360	22,988 1 19	0 11 9	6,850 4 5	91,336 5 4
1863–'64, (one year)	44,149	17,611 8 0	0 8 0	5,227 1 9	69,694 7 2
1864–'65, (one year)	54,413	20,596 15 12	0 7 13	6,074 3 0	80,692 7 8
1865–'66, (one year)	59,576	19,775 16 0	0 6 15	5,893 16 10	78,584 19 1
Total	319,695	185,488 0 8	0 11 14½	57,822 10 9	730,454 3 9

The subjoined table gives the monthly results of the operations of the company in Victoria from January, 1865, to June, 1866, both inclusive. The crushing apparatus consisted of seven stamping-mills or batteries, composed in the aggregate of 80 heads, each weighing, including the stem, from six to eight hundred weight.

Cost and returns from January, 1865, to June, 1866.

Period.	Quartz stamped.	Quartz stamped per week.	Duty per stamp per day.	Produce of gold.	Produce per ton.	Gold per ton in tailings by assay.	Total mine cost per ton.	Total reduction cost per ton.	Pyrites.			Price of gold per oz.	Proceeds of gold.
									Treated.	Yield per ton.	Profit.		
1865.	*Tons.*	*Tons.*	*Cwt. qr.*	*Ounces.*	*Dwt gr.*	*Dwt. gr.*	£ *s. d.*	£ *s. d*	*Tons.*	*Oz. dwt.*	£	£ *s. d.*	£
January	3,412	853	49 0	1,039	6 2	1 15	.....	.....	.....	.....	.....	3 16 0	4,147
February	4,551	910	48 2	1,566	6 22	1 15	.....	.....	.....	.....	.....	3 16 0	6,272
March	3,677	919	54 0	1,006	5 11	1 22	0 11 0	0 7 9	85	2 7½	460	3 16 0	4,163
April	3,326	831	58 0	868	5 5	1 3	0 16 0	0 6 6	.....	.....	.....	3 16 0	3,434
May	6,142	1,024	58 0	1,824	5 22	1 20	0 15 6	0 5 2	.....	.....	.....	3 16 0	7,213
June	4,530	1,132	56 0	1,836	8 2	2 3	0 14 9	0 7 0	.....	.....	.....	3 16 0	7,322
July	4,688	1,172	57 0	1,761	7 12	1 23	0 13 2	0 5 6	23	3 1½	208	3 16 0	7,026
August	4,787	1,197	57 2	2,254	9 10	2 15	0 12 8	0 5 6	25	3 1	222	3 16 0	9,019
September	6,817	1,136	54 0	3,465	10 4	1 22	0 14 11	0 5 2	30	4 12	413	3 16 0	13,725
October	4,774	1,193	56 3	1,997	8 8	2 3	0 11 2	0 7 3	.....	.....	.....	3 15 4	7,876
November	4,676	1,169	57 3	1,661	7 2	2 15	0 14 7	0 8 2	.....	.....	.....	3 15 1	6,562
December	4,195	1,049	54 3	1,316	6 7	2 6	0 16 1	0 11 2	.....	.....	.....	3 14 10	5,172
1866.													
January	4,177	1,044	53 0	1,377	6 14	2 6	0 15 3	0 9 4	.....	.....	.....	3 14 10	5,438
February	4,511	1,128	53 2	1,602	7 2	1 22	0 13 11	0 8 0	105	3 1	856	3 14 10	6,319
March	4,830	1,207	57 0	1,514	6 6	1 23	0 11 9	0 6 7	.....	.....	.....	3 15 4	5,999
April	6,778	1,129	55 0	1,946	5 18	2 6	0 10 10	0 6 6	40¼	2 10	280	3 15 4	7,728
May	4,783	1,196	57 0	1,111	4 15½	1 16	0 11 0	0 6 2	19	2 11	.....	3 15 9	4,435
June	4,877	1,219	63 3	911	3 17¾	1 17	0 10 6	0 7 0	19	3 3	286	3 15 9	3,616

BALLARAT.—The following workings in this locality are classed as alluvial:

Cosmopolitan.—Commenced 1857; claim 880 feet on the gutter; basaltic rock 112 feet in thickness; total length of drivages, 2,500 feet; stuff puddled and washed up daily. This undertaking had produced 38,249 ounces 4 pennyweights 19 grains of gold, of the value of £152,442, and paid dividends to the amount of £125,454 up to November 19, 1864.

United Extended Band of Hope.—Extent of claim, 36,040 feet; commenced in 1856, and had yielded gold to the value of £259,547; of which amount £147,200 had been paid in dividends up to 31st December, 1865.

Defiance Company.—Commenced 1856, and had afforded 20,197 ounces 18 pennyweights of gold, of the value of £81,102; out of which £66,483 had been paid in dividends up to December 24, 1864.

Koh-i-noor.—Commenced 1857; produce, 60,332 ounces; value, £241,233; dividends paid, £176,080, up to December 6, 1864.

Prince of Wales.—Commenced February, 1857; gold produced, 22,912 ounces 11 pennyweights 19 grains; value, £90,735; dividends paid, £51,552, up to December 10, 1864.

Alston and Weardale.—Commenced July, 1858; gold produced, 2,585 ounces 15 pennyweights 3 grains; value, £10,451; dividends paid, £4,884, up to August, 1864.

Great Extended.—Commenced 1857; amount of gold produced, 82,754 ounces 9 pennyweights 14 grains: value, £325,967; dividends paid, £274,450, up to December 4, 1864.

BUNINYONG.—*Buninyong Mining Company.*—Alluvial; commenced November, 1857; gold produced, 43,175 ounces 16 pennyweights 22 grains; value, £172,695; dividends paid, £88,007, previous to November 26, 1864.

DAYLESFORD.—*Near Wombat Hill.*—Alluvial; commenced April, 1861; gold produced, 14,942 ounces 14 pennyweights 19 grains: value, £58,059; dividends paid, £38,400, up to November 5, 1864.

BENDIGO.—*Catherine Reef United.*—Quartz: claim, 501 yards, held under a lease from the government: vein, 4 feet wide, with strike 23° west of north, and a dip to the east: commenced March, 1861: gold produced, 24,930 ounces 15 pennyweights 12 grains: value, £95,784; dividends paid, £29,735, previous to December 17, 1864.

SCARSDALE.—*Arrowsmith.*—Alluvial: area of claim, 133 acres: depth of basalt, 84 feet: 2 gutters running parallel: depth of wash dirt, 4½ feet; gold produced, 4,272 ounces 14 pennyweights 12 grains: value, £17,090; dividends paid, £4,000, up to September, 1864.

HAPPY VALLEY.—*British Gold Mining Company.*—Alluvial: extent of claim, 30 acres: held under a lease from the government: the gutter is 80 feet in width, and the depth of the wash dirt about 3 feet: commenced in July, 1860: produce of gold, 17,591 ounces 6 pennyweights 1 grain; value, £70,126: dividends paid, £40,800, up to March 4, 1866.

Try Again Gold Mining Company.—Alluvial: commenced September, 1859: extent of claim, 49 acres: held under a lease from the Crown;

wash dirt from 2 to 3 feet in thickness; gold produced, 6,153 ounces 7 pennyweights 8 grains; value, £24,535; dividends paid, £9,802, up to December 10, 1864.

Cleft in the Rock.—Alluvial; commenced November, 1859; extent of concession, 50 acres; held under a lease from the Crown; main lead bearing north and south; thickness of pay dirt from 2 to 7 feet; produce of gold, 3,848 ounces 14 pennyweights 11 grains; value, £15,287; dividends paid, £5,960, up to December 12, 1864.

WOOD'S POINT.—*Alps Great Central Gold Mining Company.*—Quartz; commenced July, 1863; produced 27,500 ounces of gold; value, £92,812, up to July, 1865.

Hope Mining Company.—Quartz; commenced July, 1863; produce of gold, 8,732 ounces 3 pennyweight; value, £27,032, up to July, 1865.

NEW SOUTH WALES.

This new colony next adjoins Victoria upon the north and west, and is the oldest settled portion of Australia, having been founded by the government of Great Britain as a penal settlement in the year 1788. As a gold-producing region it cannot rank with Victoria, and the statistical returns are not as complete. The total production, up to the close of 1860, amounted to about £8,000,000, while the exports from Victoria amounted to nearly £90,000,000 for the same period. According to the government returns, entitled Statistical Abstract for the several Colonial and other Possessions of the United Kingdom, 1866, cited by Mr. Phillips, the export of coined and uncoined gold from this colony up to 1864 had been nearly as follows:

Exports of coined and uncoined gold, New South Wales.

Period.	Quantity.	Value.
	Ounces.	
1851	144,120	£470,836
1852	818,751	2,660,945
1853	548,152	1,781,272
1854	237,910	773,209
1855	64,384	209,250
1856	46,999	156,151
1857	277,531	1,101,448
1858	443,462	1,773,851
1859	427,558	1,704,774
1860	472,886	1,878,588
1861	507,021	2,010,263
1862	741,055	2,984,269
1863	593,699	2,362,054
1864	740,048	2,952,471
Totals	6,063,576	£22,819,381

Mr. Phillips observes that it is probable a large part of the gold exported from New South Wales is the product of other portions of Australia, and estimates the total produce of the gold fields, since their discovery

in 1851, as not more than 4,000,000 ounces, and the present annual yield as 320,000 ounces, value at $19 per ounce, $6,080,000.[1]

According to the Rev. W. B. Clarke, the gold, as in Victoria, is derived chiefly from the Lower Silurian formation, but he believes it to exist in almost every distinctive rock in New South Wales. The alluvial deposits are not so extensive as in Victoria, and it is found difficult to assign them with any precision to the epochs adopted by Mr. Selwyn for the latter. The gold alluvia of the Uralla rest chiefly on granite, and are covered by a great thickness of basalt, as in the Victoria fields, and are probably of the same period.

SOUTH AUSTRALIA AND TASMANIA.

These colonies also produce a small amount of gold annually, valued in the aggregate, from 1851 to 1860, at £374,000, one-half of which is supposed to have come from New Zealand. The following table of the amounts and value of gold exported from these colonies, including some from New Zealand, from the discovery of gold to the close of 1860, is given by Mr. Phillips, page 121:

Exports of gold, including some from New Zealand.

Year.	Quantity.	Value.
	Ounces.	
1852	5,250	£21,000
1853	5,250	21,000
1854	5,250	21,000
1855	5,250	21,000
1856	5,250	21,000
1857	15,639	62,556
1858	18,680	74,720
1859	16,431	65,724
1860	16,500	66,000
Total	93,500	£374,000

QUEENSLAND.

This is a comparatively new British colony, and comprises the whole northeastern corner of Australia. Its area is 678,000 square miles, nearly four times as great as that of France. It produces annually a small quantity of gold, and the exports in 1866, as furnished by the customs department, amounted to £85,521, or about $400,000.

The commissioners of the colony exhibited some fine specimens of gold nuggets and gold-bearing quartz at the Exposition, the heaviest nugget weighing, originally, 84 ounces, but they were not accompanied by any statistics in detail. According to Dicker's Mining Record of April 17, 1866, there is but one quartz-crushing establishment in the colony, and only one quartz mining company at work.

[1] For some later statistics of production, see page 107,

CHAPTER III.

THE GOLD PRODUCTION OF EUROPE, ASIA, AND AFRICA.

RUSSIAN GOLD-FIELD—PRODUCTION OF DIFFERENT DISTRICTS—TOTAL PRODUCTION—MINES REPRESENTED AT THE PARIS EXHIBITION—GREAT EXTENT OF THE GOLD FIELD—AUSTRIAN GOLD PRODUCTION—SPAIN—ITALY—ROUMANIA—FRANCE—UNITED KINGDOM—GOLD LOCALITIES IN CHINA—JAPANESE GOLD MINES AND EXPORTS—METHOD OF WASHING—AFRICA.—RÉSUMÉ OF TOTAL GOLD PRODUCTION.

RUSSIA.

In the Ural mountains vein mining for gold preceded the modern alluvial or placer washing. The existence of gold in these mountains and in the Altai was known to Herodotus, but its rediscovery by the Russians dates from 1743 and 1744, during explorations ordered by Peter the Great. A result of this discovery was the establishment of works for the extraction of the metal from the ores at Woitski in 1745. In the same year work was commenced by the government at Bérésofsk, and this mine has continued in operation until the present time. Its production up to 1853 has been estimated at 10,267 kilograms of pure gold,[1] or about 3,330,258 troy ounces, which, at $20 per ounce, gives the aggregate of $6,605,160

Other veins have been discovered, but have not, in general, been remunerative, and nearly all the gold product of Russia is from placers. Work upon them was commenced by the government in 1814, and from that year to 1820 the production was but slight. According to M. Michel Chevalier[2] the product in 1816 was only 96¼ kilograms of gold, and from 1810 to 1825, only 933 kilograms. This was for the western Uralian gold field only. Gold was afterwards found upon the eastern slope of the chain, and traced eastward into Siberia. The active working of the placers dates from 1829 in western Siberia, and from 1838 for eastern Siberia, where the placers are more numerous and extensive than in the western portions, and, in fact, have an enormous extension eastward to the Pacific coast. According to the official data furnished at the Exposition by the Imperial Commission,[3] the gold washings of the empire are now found upon the eastern side of the Ural mountains, in the governments of Perm and of Orenburg; in the system Sayano Altaique, (governments of Tomsk and of Yenisseisk,) and in the system Yablonnoi

[1] M. Narcés Tarassenko-Otreschkoff, De l'Or et de l'Argent, Chapter XI, p. 128; cited by Dalloz, De la Propriété des Mines, II, 329.

[2] Cours d'Econ. Politique, 3d volume, De la Monnaie, section VI, Chapter II, p. 265; cited by Dalloz.

[3] Aperçu Statistique des Forces Productives de la Russie, par M. de Buschen, annexé au Catalogue Special de la section Russie: 8vo; Paris, 1867.

NEW ZEALAND.

Gold was first discovered in New Zealand in 1842, but attracted little attention until 1852, when it was also found in Auckland and Otago. Since then, the known limits of the gold region have been greatly extended by discoveries from year to year up to the present time, and gold is now mined over a vast area in the provinces of Otago, Auckland, Nelson, and Canterbury.

According to the reports and awards of jurors of the New Zealand exhibition, 1865, the amount of gold exported from the province of Otago from 1861 to 1865, inclusive, was 1,699,667 ozs., 7 dwt., 6 gr.

The following table, compiled from the monthly returns of gold exported, and published by Mr. Phillips, shows the quantity and value of gold from the gold fields in each island and the whole of New Zealand, exported from the colony from 1st of April, 1857, to 31st December, 1864. In these returns the value was calculated on the estimated rate of £3, 17*s.* 6*d.* per ounce, with the exception of the gold from the North island.

Exports of gold from New Zealand.

Produce of—	During 1864.		From April 1, 1857, to Dec. 31, 1863.		Total exported from New Zealand to Dec. 31, 1864.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Ounces.		*Ounces.*		*Ounces.*	
North Island	3,448	£10,552	6,076	£19,323	9,524	£29,875
South Island	476,723	1,847,295	1,263,112	4,894,560	1,739,835	6.741,855
Total from New Zealand	480,171	£1,857,847	1,269,188	£4,913,883	1,749,359	£6,771,730

According to the Rev. W. B. Clarke, the rock formations of New Zealand are a repetition in kind of those of Australia. The alluvial deposits are deep and extensive, and similar to the Australian. A large part of the gold is produced by sluicing, and but little attention has yet been paid to working the veins.

If we assume that the production of gold in New Zealand has diminished yearly in the same ratio as that of Victoria, the total product for 1867 was approximately $6,000,000, and this is the amount credited to the colony in the summary of total production of the world, given at the end of Chapter III, and in Chapter VIII.

(Transbaicalie.) Under the Administration General of Mines
ɜgions are divided into districts, from each of which the returns
uction are separately obtained. The mines are no longer monop-
ɔy the government, but are thrown open to private enterprise,
ny of the miners have made large fortunes. The placers appear
uite equal in richness to those worked in California and Australia.
the product of these districts was as follows:

Gold washings in Siberia in 1863.

Districts.	Number of washings.	Number of miners.	Product of washings in poods.[1]	Product of washings in kilograms.
			Poods. l.	*Kilog.*
, (Transbaicalie,) property of his Majesty the Emperor	4	927	21 15	350.4
k, (Transbaicalie,) private property	23	2,447	113 7	1,855.3
linsk, (Transbaicalie,) private property.....	9	1,053	263 3	439.8
(Yakoutsk,) private property.....	26	4,873	185 14	3,038.5
Nijne-Oudinsk, (government of Yenisseisk and Irkoutsk,) roperty.....	21	1,402	35 27	584.8
sk, (government of Yenisseisk,) private property.....	32	1,667	54 33	898.8
(government of Yenisseisk,) private property	24	786	16 27	273.3
(central portion,) private property.....	63	5,878	164 3	2,689.9
(northern part,) private property.....	79	9,039	394 0	6,459.0
government of Tomsk,) private property.....	81	1,449	25 5	411.9
overnment of Tomsk,) private property	1	18	0 15	6.1
vernment of Tomsk,) property of his Majesty the Emperor.	17	3,243	85 4	1,395.1
nsk, (washings of Tarbagati,) private property.....	8	1,062	5 38	97.5
urg, (government of Perm,) property of the state	35	1,185	40 10	659.8
at, (government of Perm,) property of the state.....				
k, (government of Perm,) property of the state.....	38	1,356	25 17	416.8
overnment of Orenburg,) property of the state.....	38	1,586	43 21	713.5
(government of Orenburg,) property of the state	1	67	0 12	4.9
nd country of the Cossacks of the Ural, private property ..	205	10,975	84 18	1,384.4
ings in, private property.....	39	8,764	136 29	2,313.1
l.....	745	57,957	1,459 8	23,920.0

otal value of the gold production for the year 1863, calculated
e price established by the Crown, which buys all the produce of
ıes, was 19,307,112 roubles, (77,228,448 francs,) equivalent to
15,445,669.

ıost profitable washings are those of Olekminsk, of Bargousinsk,
Zlatoust. Those of the Altai come next. No figures of the pro-
of the washings of Goroblagodat have been received since 1861.
ıer production was from four to five poods, about 80 kilograms,

[1] ussian *pood* equals 16.380 kilograms, according to the tables in the official cata-
he Russian department of the Exposition. Other authorities: M. Tarassenko-
off places it as equal to 16.370 kilograms, and M. Le Play, (*Voyage dans la Russie*
ale,) at 16 372 kilograms.

or $51,590. In general, the production of gold has not been increasing since 1850, as shown by the following tabular statement of the production for the years stated:

Years.	Product of washings.		Value.	
	In poods.	In kilograms.	In roubles.	In francs.
	Poods. l.			
1830	360 8	5,904.9	4,665,920	18,663,680
1840	567 39	9,311.0	7,515,246	30,060,984
1850	1,453 32	23,872.8	19,235,936	76,943,744
1860	1,457 16	23,891.8	19,283,428	77,133,712
1861	1,456 5	23,870.9	19,265,986	77,063,944
1862	1,460 29	23,946.3	19,318,915	77,275,660
1863	1,459 8	23,920.0	19,367,112	77,228,448

According to Mr. Tarassenko-Otreschkoff,[1] the total production of gold from the commencement of mining, in 1745, up to 1810, a period of 65 years, was 25,537 kilograms, valued at 85,194,720 francs. This is founded upon an estimate of an average annual production of 392 kilograms, value 1,310,688 francs. The same authority gives for the period from 1810 to 1825 an average annual product of 1,095 kilograms—value 3,655,360 francs—and a total during the 15 years of 16,435 kilograms, valued at 54,830,448 francs. In the next period, from 1824 to 1848, the washings of the Ural and of Siberia attained their great development. For these years the following figures have been adopted by M. Michel Chevalier and by M. Tooke, and are cited by Dalloz. The estimates include a small quantity of fine gold taken from silver bars.

Annual production of fine gold from the placers and other sources in Russia from 1824 *to* 1848.

Years.	According to Chevalier.	According to Tooke.	Years.	According to Chevalier.	According to Tooke.
	Kilograms.	*Kilograms.*		*Kilograms.*	*Kilograms.*
1825	4,764	4,450	1838	9,317	9,079
1826	4,811	4,456	1839	9,345	9,084
1827	5,609	5,323	1840	10,288	10,126
1828	5,766	5,500	1841	12,129	11,788
1829	5,722	5,444	1842	16,498	16,444
1830	6,839	6,545	1843	22,214	22,194
1831	7,043	6,862	1844	22,817	23,207
1832	7,389	7,095	1845	23,300	23,976
1833	7,284	7,067	1646	28,908	.....
1834	7,222	7,025	1847	30,854	.....
1835	7,408	7,144			
1836	7,613	7,371	Total	271,521	208,302
1837	8,381	8,120			

Lieutenant General Tchevkine and Colonel Ozersky estimate that the total production of the Russian gold mines for the first half of this cen-

[1] Cited by Dalloz, p. 334.

)m 1800 to 1850, was 21,260 poods of pure gold, or more than kilograms, of which more than 295,360 kilograms was obtained e year 1826.[1]

roduction of gold from 1847 to 1855 was as follows, according to ssenko-Otreschkoff:[2]

	Kilograms.
.....	27, 153. 737
.....	25, 074. 747
.....	23, 319. 475
.....	23, 781. 517
.....	21, 673. 880
.....	22, 034. 427
.....	24, 595. 925
otal.....	167, 633. 708

)llowing table has been prepared from the various sources cited, ibits the total production of the Russian gold mines up to the 64. The production for the five years from 1854 to 1860, for io returns have been found, is estimated to have averaged kilograms a year, this being the mean of the production for the 50 and 1860, according to the official data at the Exposition:

Total production of Russian gold mines to 1864.

Years.	Kilograms.	Value in francs.	Value in dollars.
.....	25, 537. 000	85, 194, 720	17, 038, 944
.....	16, 435. 000	54, 830, 448	10, 966, 089
.....	271, 521. 000	875, 492, 312	175, 098, 462
.....	167, 633. 708	539, 518, 128	107, 903, 625
.....	119, 411. 500	385, 030, 440	77, 006, 088
.....	23, 891. 800	77, 133, 712	15, 426, 742
.....	23, 870. 900	77, 063, 944	15, 412, 788
.....	23, 946. 300	77, 275, 660	15, 455, 132
.....	23, 920. 000	77, 228, 448	15, 445, 689
tal.....	696, 167. 208	2, 248, 767, 812	$499, 753, 562

exhibits a total production of 696,167 kilograms from 1745 to period of 119 years; valued at 2,248,767,812 francs, or, at five) a dollar, $449,753,562. The average value of the annual pro- for the last four years given in the table is $15,335,088. It is ., however, that the production is now increasing, and that in 1864 early "23 tons," and in 1865 "over 26 tons." It may, therefore, estimated that the total production of gold in Russia up to the 8 was over $525,000,000, stated in round numbers.

t from the Jour. des Mines de Russie in the Annales des Mines, 5 serie, t. 3, p. 801.
Dalloz, ii, 337.
)y Dalloz, ii, 338.

The following table gives the production of the Russian mines from 1814 to 1859, inclusive, in troy pounds, according to Tschewkin:[1]

	Troy pounds.
1814 to 1820	11,085
1820 to 1830	73,200
1830 to 1840	175,460
1840 to 1850	553,955
1850 to 1860	687,025
Total in troy pounds	1,500,725

Nearly the whole of this product is obtained from washing, very little, as before stated, being from veins. The most productive placers are in the districts of Olekminsk, Bargousinsk and Zlatoust. Those of the Altai are next in importance. The placers found upon many of the tributaries of the Amoor, and many places within the limits of the governments of Irkoutsk and the province of Yakoutsk, are regarded as exceedingly promising.

The gold districts and washings specially represented in the Exposition were as follows:

Mines of the Altai.—Government of Tomsk, districts of Biysk, of Kouznetzk, and of Barnaoul, by the Administration of the Mines of the Altai. (Catalogue Special, 433.)

Iagodni (or Yagodny) mines.—Government of Perm, district of Ekatherinburg, by Benjamin Astacheff. (Catalogue Special, 438.)

This exhibit contained a nugget of gold in quartz, weighing 3½ *livres*,[2] (about 3 pounds avoirdupois,) and one from the government of Yenisseisk weighing 6 livres; a sample of pure gold in powder, and a view of the gold workings and aqueducts of Yagodin. This view is accompanied by an explanation which states that the mines are upon the east slope of the Ural mountains, under the superintendence of Mr. Focht. The auriferous gravel is about 72 feet deep, and it is worked in an open quarry by a system of terraces or underhand stoping. The "pay" appears to be disseminated throughout the mass, for it is all removed. It is loaded in one-horse carts which rise an inclined plane or corduroy roadway, and take the gravel to mills or machines for washing. This exploitation was commenced in 1862, and the production of gold has varied from 14 to 18 poods per annum, valued at 200,000 roubles, (800,000 francs,) about $160,000. The washing machines are driven by steam, and 400 workmen are employed.

Miask gold mines.—Government of Orenburg, district of Troitsk:

1. Specimens of the earth and rocks found above and below the pay gravel of the mines of Andréeisk and of Miask.

2. Specimens of the pay gravel.

[1] Tschewkin, Jour. des Mines, quoted in Ann. des Mines, (5,) III, p 805. Archiv. für wissenschaftliche Kunde von Russland, 1865, p. 397; cited by Phillips, Met. Gold and Silver, p. 24.

[2] One livre = 0.41 kilogram.

3. Specimens enriched by washing.

4. Black sand and gold from washings.

This placer was discovered in 1823. In 1863, 27,000,000 of poods of auriferous sand and gravel had been washed.

Temissei.—District of——. Nuggets of gold, black sand, and pay gravel, by Michel Sideroff. (Cat. Spec., 508.)

Taguil.—Government of Perm; specimens of the gold and alluvia from the mines of Paul Demidoff, (exhibitor.)

These gold washings have produced, since 1823, nearly 1,155 poods of gold, and the washings of platina (see "Platina") have yielded nearly 3,105 poods of this metal since 1825. 107 gold placers or washings, and 20 of platina, have been discovered upon the property of this exhibitor.

GENERAL OBSERVATIONS UPON THE RUSSIAN GOLD FIELD.

The exhibition made by Russia also contained some very interesting models of machines used for washing auriferous sands and gravels on a large scale, now much used in the Russian and Siberian gold fields. It seems probable that, the climate permitting, the American methods of washing might be advantageously adopted there.

There have been various estimates made of the richness of the auriferous gravels and sands, &c., of the Russian mines, but it is evident to any one practically familiar with gold washing operations on a large scale, that it is exceedingly difficult, if not impossible, to arrive at any general conclusion regarding the quantity of gold contained in placers. Scarcely any two deposits are alike in the ratio of gold to the alluvia.

According to Chevalier,[1] in the washings of the Ural, before they were extended eastward, the yield in gold was from two to two and a half millionths of the weight of the earth washed. M. Tarassenko-Otreschkoff cites gold mines belonging to the Crown in the Urals, where the average yield was two grams, 3.37 grains, and six grams to the 1,637 kilograms of earth washed. In the placers of the Altai, washings have been found that have given regular returns two, three, and four times as great as the average of the placers of the Ural. M. Tarassenko-Otreschoff states that the auriferous deposits of the governments of Tomsk and of Yenisseisk contain on an average from four to eight grams of gold to 1,637 kilograms, as washed. Some produce only from two to three grams. The deposits of eastern Siberia are richer than those in western Siberia and the Urals. The same authority estimates the yield of the washings in the Kirghese district at two grams to 1,637 kilograms. It is stated in the Annales du Commerce Intérieur that in the year 1852 61,232 grams of gold were extracted in the Kirghese districts from 5,416,800 poods (88,627,184 kilograms) of gravel.

According to Phillips the gold-bearing veins of the Berezofsk mine are generally small, and traverse a sort of decomposed granite which itself traverses talcose, chloritic, and micaceous shales in the form of

[1] Page 268, cited by Dalloz, p. 333, chap. XII; § 6, p. 156, cited by Dalloz.

veins or dikes. The most productive veins are quartz, cutting the granite at right angles. This mine formerly yielded from 600 to 800 pounds of gold annually, but the production had decreased to 100 pounds in 1850. During the period of greatest success the yield per ton of stamped ore was from 6 to 11 dwts.

At the Soimanofsk mines, north of Miask, there are placer deposits of gold upon the rough decomposed surface of limestone, closely resembling the placers in the vicinity of Murphy's, Calaveras county, California, where, as in Russia, the remains of the mammoth and the mastodon are found in the gravel with the gold. From one of the placers, near Miask, a nugget of gold was taken that weighed 97 pounds troy,[2] and is now in the museum of the Imperial School of Mines at St. Petersburg.

The Uralian and Siberian gold field is, perhaps, the most extensive on the globe, stretching, as it does, along the Ural, and to the eastward through Siberia to the Kamtschatka and Ouskoi mountains bordering the Pacific ocean, a distance, as remarked by Chevalier, "which embraces the half of a circle which would be described in making the circuit of the globe on these latitudes." The auriferous deposits are there distributed in numerous groups and over a large surface, and the zone over which they are spread is of an average width of about 550 miles.

It appears that these Siberian gold deposits were known and worked, at least in part, at a very remote period, for abandoned workings have been found at many points, and are known among the Russians as *puits finnois*, which, if not made by the ancient Scythian tribes, as is probable, at least belong to an epoch anterior to the conquest of Siberia by the Tartars 2,000 years ago.[3]

These ancient mines have been traced by Gmelin, Lepechin, and Pallas, on the southern and eastern borders of the Ural mountains. The only tools found in the old pits were wedges and hammers made of copper, and heavy sledges made of stone, with grooves by which handles appear to have been attached. The tusks of boars appear to have been used to scrape out the gold, and some leather bags have been found. Numerous fragments of earthenware are found to a great distance around the ruins, and in some places human bones have been discovered in the old passages and galleries, appearing as if the mines had caved in upon the miners. The ores raised at some of these mines were smelted in rude furnaces.[4]

The Uralian and Siberian gold regions have been visited and described by several eminent geologists. Baron Humboldt made an extensive journey there in 1829, at the request of the Emperor Nicholas, and obtained the materials for his great work on Central Asia; and, later, Sir Roderick I. Murchison made explorations in the Urals, an account of which is given in his work entitled "Russia in Europe and the Urals." Much information upon the Russian mines is also given in the "Annuaire des Mines de Russie." The production of gold in these regions has been

[1] Geological Reconnaissance in California, p. 256. [2] Siluria, p. 484.
[3] Dalloz, ii, 330. [4] Jacob on the Precious Metals, i, 39.

retarded to a great extent by the control exercised over them by the government, and the imposition of heavy taxes. In 1849, the Emperor Nicholas, by the edict of 14th (26th) of April, subjected mining operations to a progressive tax, which, for such enterprises or claims as yielded upwards of 40 poods of metal, (655 kilograms, or 2,170,000 francs, about $434,000 in value,) amounted to from 30 to 35 per cent. upon the gross product. This was also independent of a special tax for police purposes, which amounted to about $8 upon every pound of gold of the mint standard.[1]

AUSTRIA.

The production of gold in the Austrian empire is chiefly from Transylvania and Hungary, and reached the amount of 1,824 kilograms (58,672 ounces troy) in 1865. At the Exhibition of 1862 it was stated that the production amounted to about 3,200 pounds troy annually. The gold is obtained from ores of low percentage, from veins which formerly were supposed to traverse the oldest rocks, but these rocks have been proved to be of the latest Secondary, or even Tertiary periods.

According to Dalloz[2] the production of gold has been increasing since 1772. From 1825 to 1848 the average annual product was 1,700 kilograms; and in 1855, according to M. Otreschkoff,[3] it was 2,013 kilograms, valued at 6,750,000 francs.

M. Callon has published in the "Annales des Mines" for 1861 extracts from the statistical publications of M. de Carnall, from which, and from the official documents published by the Austrian minister of finances, the following figures are taken:[4]

	Kilograms.
1855	1,478.454
1856	2,912.850
1857	2,722.400
1858	2,470.450
1859	1,646.627

All the preceding statistics differ somewhat from the following, compiled for the writer, from official sources, at the Exposition:

Annual production of gold in the Austrian empire from 1819 *to* 1865, *inclusive.*

Year.	Kilograms.	Year.	Kilograms.	Year.	Kilograms.
1819 to 1828, about	1,105	1853	1,766	1860	1,596
1829 to 1838, about	1,514	1854	1,788	1861	1,588
1839 to 1848, about	1,729	1855	1,733	1862	1,700
1849	14	1856	1,635	1863	1,514
1850	1,648	1857	1,528	1864	1,799
1851	1,919	1858	1,387	1865	1,824
1852	1,676	1859	1,647		

[1] *Vide* Chevalier on Gold, Cobden's translation, pp. 82–83.

[2] De la Propriété des Mines, ii, p. 291. [3] De l'Or et de l'Argent, i, pp. 104, 108.

[4] Cited by Dalloz, vol. ii, p. 292.

The production of gold ores for the three years ending in 1866 was as follows:[1]

Years.	Vienna centners.[2]	Value in florins.	Value in dollars.
1863	132,963	292,598	$146,300
1864	159,485	432,666	218,333
1865	162,303	320,266	160,222

SPAIN.

Gold and silver mines have been worked in Spain from very remote periods. Both Strabo and Pliny mention the abundance of the precious metals in the peninsula, and state that Hannibal would not have had the means of continuing the war in Italy except by the discovery of many mines of gold and silver in the province of Carthagena. According to M. Boekh these mines yielded 6,500 kilograms of fine gold during the time of the Romans. The gold mines were also worked by the Moors.

The present production of the country is exceedingly small, probably not over $6,000 to $8,000 in value annually. The data furnished by the Royal Commissioner at the Exposition show an annual production of 7,660 grams, valued at "9,958.800 *écus*," (probably $14,500,) but the source is not stated.

ITALY.

The mineral collections from Italy in the Exposition contained some specimens of the gold ores of the country and some remarkably fine masses of crystalline gold, in regard to which no information could be obtained.

The gold localities of Italy were well known to the ancients, and, according to Strabo, the production at one time was so great that the value of the metal in Italy was reduced one-third.[3]

The gold of Italy is obtained from the auriferous pyrites of the Alps; the auriferous quartz of the Ligurian Appenines, in the valleys of Anzasca, of Antigario, and from the sands brought down the beds of the Orco, the Tessin, the Po, and the Serio. The amount so obtained was estimated in 1862 at 3,200 ounces annually, from the veins, and only about 300 ounces from the placers. The total production at the present time, in the valleys named, is valued at about 500,000 francs. There are nine mines which are now worked, three of which have amalgamating mills. Five of these mines have produced 94 kilograms of gold, valued at 22,655 francs. There are 610 workmen, and their wages amount to 256,600 francs annually.[4]

According to Phillips[5] the only gold mines of consequence at the present time are in Savoy and Piedmont. It is extracted from the valleys of

[1] Der Bergwerks-Betrieb für das Jahr 1865; Vienna, 1867.

[2] One Vienna centner equals 56.00199 kilograms; one florin equals 2.5 francs.

[3] Strabo, lib. iv, cap. 6.

[4] Italie Économique en 1867: 8vo.; Florence, 1867.

[5] Metallurgy of Gold and Silver, p. 20.

Anzasca, Toppa, and Antrona, and in smaller quantity in those of Alagna, Sesia, and Novara. The principal mines are at Peschiera, and Minera di Sotta, Anzasca. The ore is an auriferous pyrites, containing an average of about 12 pennyweights of gold per ton.

In 1844 the yield of the different valleys was as follows:

Name.	Kilos.	Value.
Anzasca	153.	$80,460
Toppa	19.	10,160
Antrona	20.	10,750
Alagna, Sesia, and Novara		1,250
		$102,620

The development of some of these Italian mines has recently been undertaken by English companies, and Mr. Phillips gives in the appendix to his work some of the first returns, supplied to him by Mr. J. C. Goodman, as follows:

Toppa Gold-mining Company.

Year.	Ounces.	Value.
1864	509.275	£1,798 18 09
1865	574.575	2,032 14 05
1866	1,400.925	4,927 15 08
	2,869.050	£8,789 08 10

The ore has averaged 1 ounce 5 pennyweights of gold per ton.

Anzasca Gold-mining Company.

Year.	Ounces.	Value.
1864	381.650	£1,105 14 10
1865	740.475	2,291 14 09
1866	1,746.925	4,966 16 03
Yield since 1863	2,869.050	£8,364 05 10

Pestarena Gold-mining Company.

Year.	Ounces.	Value.
1866	2,806.500	£9,125 17 09
1867, (to July)	2,729.775	8,669 14 00

The ore of this mine has yielded 2½ ounces per ton. The rocks which the veins traverse are composed of micaceous and talcose slates, belonging probably to the Silurian period. The veins are numerous, and are sometimes as much as three feet in thickness, containing a mixture of iron and sometimes of arsenical pyrites, with strings of quartz and spots of galena. The shafts in 1862 had been sunk to a depth of about 500

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feet, and the workings extend horizontally for more than three-quarters of a mile.[1]

The foregoing data show that the total yield of all these mines for the year 1866 was £19,050, or about $95,250.

ROUMANIA.

Some very coarse alluvial or placer gold was exhibited from this region, but no information in detail of the extent of the deposits, or of the production, could be obtained. Gold is found in most of the rivers flowing from the Carpathian mountains in this Principality, but chiefly in the Olto, the Ardgèche, and their branches. These deposits were formerly worked by state slaves, and the proceeds belonged to the reigning princesses. A very few persons are now engaged in washing on their own account.

Vein gold is found in the mountains of Ardgèche, Rucar, Tergoviste, Bacau, Niamtzo, and of Suciara. The quartz veins of Pazra contain chalcopyrite, auriferous iron pyrites, and argentiferous galena.

FRANCE.

A gold-bearing vein was formerly worked at La Gardette in the department of the Isère, but it did not pay expenses and was abandoned in 1841, after having been worked at intervals since 1700.

A small amount of alluvial gold is found in the sands of the Rhine, but the production is insignificant. According to M. Daubrée, who made a report upon the gold deposits of the Rhine to the Academy of Sciences,[2] the production for the year 1846 was estimated at about $9,000, and the washers usually made from one and a half to two francs a day. Since that time the production from the Rhine has greatly decreased, being only 1,300 grams in 1853, and worth about 4,446 francs. The production from other sources, chiefly from auriferous galena, and the cinders and refuse of jewellers, has been increasing, as will be seen by the following statement, showing an average production of about $82,000 in value, annually.[3]

Production of gold in France.

Year.	Weight.	Value.	Year.	Weight.	Value.
	Grams.	*Francs.*		*Grams.*	*Francs.*
1853	120, 200	411, 944	1858	95, 660	326, 108
1854	156, 900	538, 000	1859	76, 600	262, 640
1855	240, 284	823, 045	Total	837, 987	2, 868, 443
1856	72, 663	247, 010			
1857	75, 680	259, 696			

[1] Kingdom of Italy, International Exhibition of 1862.

[2] Compte Rendus, xxii, 639; 1846.

[3] Compiled from the official tables in the Resumé des Travaux Statistiques for 1860.

GREAT BRITAIN AND IRELAND.

The following notices of the auriferous localities of the United Kingdom are condensed chiefly from the recently published work of Mr. Phillips.

Gold has long been known to exist in Cornwall in small quantities in the stream gravel, with tin-stone, and in minute quantities in many of the copper gossans.

In Wales there is a gold-bearing district about 25 miles square, and, according to Mr. Arthur Dean, there is a complete system of auriferous veins throughout the whole of the Snowdonian or Lower Silurian formation of North Wales. Of all the veins that have been worked in the neighborhood of Dolgelly, the Vigra and Clogau has been the most productive. This mine is about 1,000 feet above tide. The vein is nearly vertical, runs east and west, and is formed of quartz impregnated with sulphides of iron, lead, and copper. It sometimes shows free gold.

The following table, exhibiting the returns from the various Welsh gold-mines from 1860 to 1864, the time of their greatest yield, was furnished to Mr. Phillips by Mr. Robert Hunt, keeper of mining records:

Gold produced in Merionethshire.

Mines.	1861.		1862.		1863.		1864.	
	Oz.	£.	*Oz.*	£.	*Oz.*	£.	*Oz.*	£.
Vigra and Clogau	2,886	10,816	5,299	20,390	526	1,674	2,331	3,434
Cefn Coch	.....	.....	.....	.....	25	73	346	970
Castell Carn Dochan	.....	.....	.....	.....	.....	.....	141	394
Prince of Wales	.....	.....	.....	.....	.....	.....	63	166
Gwyn-fynydd	.....	.....	.....	.....	.....	.....	6	17

The number of tons of quartz crushed in Wales, during the year 1865, is reported as 4,270, yielding 1,664 ounces of gold, about 0.39 ounce per ton. The total yield of gold in the North Wales district, up to April 1, 1866, is estimated as follows:

	Ounces of gold.
Old Dol-y-frwynog	117
Prince of Wales	63
Cwn Eisen	176
Gwyn-fynydd	6
Cefn Coch	478
Castell Carn Dochan	182
Vigra and Clogau	11,778
	12,800

The volume of Mineral Statistics of the United Kingdom for 1866, recently published, gives the following returns of Welsh gold for 1866:

Mines.	Gold quartz.			Gold.		
	Tons.	*cwt.*	*lbs.*	*Ozs.*	*dwt.*	*grs.*
Vigra and Clogau	1,159	19	8	213	14	22
Castell Carn Dochan	1,768	0	0	529	1	12
Total production for 1866	2,927	19	8	742	16	10

This added to the previous production gives a total of 13,542 ounces, the value of which may be estimated at about $243,000.

In Scotland gold was formerly found at Lead Hills, and several hundred men were employed there during the reign of James V.[1]

In Ireland, gold was discovered in 1796, in the county of Wicklow, at the base of Croghan-Kinshela. Washing continued for two years, but the results do not appear to have been satisfactory. One specimen weighed 22 ounces. The locality is now abandoned.

CHINA.

A table of localities of gold washings and mines in the Chinese empire, published in the recent work of Mr. R. Pumpelly,[2] shows that the gold regions are extensive, as there are numerous localities of the metal in no less than 14 out of the 18 provinces of the empire. The greatest number of washings are in the province of Sz'chuen, and along the branches of the Kwenlun mountain chain, which have a general east and west trend, and penetrate far into central China, between the Wei river and the Sz'chuen boundary. They are numerous also at the base of the water-shed between Kweichau and Hunan, and through the centre of Shantung, from southwest to northeast. Most of the localities mentioned furnish coarse placer gold, and some of them are mentioned as rich, and as furnishing nuggets. Little or nothing is known, however, of the production of these washings, which may long since have been exhausted. The country has long been known to have extensive sources of gold, but it is said that the working of the mines has been discontinued by the Chinese government in accordance with some of their theories of finance. The extensive auriferous regions of the Altai and other mountain ranges of eastern Siberia are doubtless prolonged into Chinese Tartary, and connect with those of central and southern China. Unless the exhaustion of these placers and veins has been greater than the imperfection of ancient methods of working allows us to suppose, this region, together with the Siberian, is now doubtless the greatest and richest gold-field which remains for exploration.

[1] Pennant's Scotland, ii, p. 130, quoted by Phillips.

[2] Geological Researches in China, Mongolia, and Japan, during the years 1862 to 1865, by Raphael Pumpelly, Smithsonian Contributions; Washington, 1866.

Mr. S. Wells Williams states[1] that gold is brought into China from Borneo and California as dust and in impure masses, (1854.) The importations at that date had reduced the relative values of gold and silver to the ratio of 1 to 14½.

The exports of bullion (gold and silver) from California to China have steadily increased from $965,887 in value in 1854 to $6,527,287 in 1866, and to $9,031,504 in 1867. (*Vide* table, Chapter I.)

Gold leaf or heavy foil is used in China in making payments not less than $40 to $50. Thin gold leaf is largely used there for gilding the wood-work of houses, and quantities were formerly exported to India.

JAPAN.

It was the reported richness of the empire of Japan in gold and silver which drew thither the early Portuguese and Dutch traders. All the early accounts of the country agree respecting the abundance of the precious metals, and they were fully sustained by the results of the Dutch trade. The annual average sales by the Dutch amounted to the value of 60 Dutch tons of gold,[3] and in one year they reached the amount of 80 tons, about $3,200,000. Among their exports were 1,400 chests of silver, (each containing 1,000 taels,[4]) or near $2,000,000 in all. This constant drain of silver appears to have excited the alarm of the Japanese, and gold was partly substituted in trade, until at length the exportation of this metal was also restricted. Its value, relatively to silver, has always been less in Japan than in other countries, and this alone has led to a large export, and with great profits. In the two years, 1670 and 1671, more than one hundred thousand kobangs[5] ($1,100,000) were exported at a profit of a million florins,[6] ($400,000.)

According to Arrai Tsikugo-no-Kami, a learned Japanese of rank, who published a tract on the "Origin of the Riches of Japan" in 1708,[7] the amount of gold and silver exported from Nagasaki from 1611 to 1706 was as follows:

	Value.
Gold, 6,192,600 kobangs	$68,118,600
Silver, 12,1268,700 taels	157,176,180
Total	$225,294,780

[1] Chinese Commercial Guide, 4th edition, p. 175. [2] Ibid.

[3] A Dutch ton of gold was 100,000 florins or $40,000. See Hildreth's "Japan as it is and was," p. 208.

[4] Hildreth, Ibid, 208. The *tael*, reckoning the picul at 133⅓ pounds avoirdupois, contains 583 grains troy. The tael is, therefore, worth about $1 40. Kaempfer considered it worth 3¾ florins, which, at 40 cents to a florin, makes the value exactly $1 40.

[5] The kobang is a gold coin, which, at that time, weighed 47 kanderins, or 274 grains troy, or 16 grains more than our eagle. It, however, contained only 224 grains of gold, worth, say, $11. It was purchased by the Dutch for six taels, or less, in silver.

[6] Hildreth, Ibid, p. 209.

[7] Ibid., 385, translated by Klaproth, Noveau Journal Asiatique, ii.

Hildreth further observes that the value of the export of the precious metals from Japan in the course of 200 years, from 1540 to 1740, must have been not less than $200,000,000.

This disproportion between the value of gold in Japan and other countries existed at the time of the visit of Commodore Perry, and the first traders made large profits by the wholesale purchase and export of the gold kobangs. A letter from the United States consul general (Mr. Harris) at Simoda, in 1857, stated that the relative values of gold and silver in Japan were as one to three and one-seventh. To avoid the great drain of gold which followed the discovery of this disproportion in the relative value of these metals, the size and weight of the gold coins were further reduced by the Japanese government.

Gold is largely used in Japan for gilding, for inlaying and overlaying metals, and for alloys with copper and silver of various colors and degrees of fineness. The first discovery of the metal in Japan is said by Sir Rutherford Alcock to date from half a century later than the first coinage in 708.[1] Before this time gold was imported from China. Arrai Tsikugo-no-Kami[2] is the authority for the statement that the first gold coins were struck by Taiko-Sama. It seems probable, however, that gold was known in the country long before.

GOLD MINES OF YESSO AND SADO.

One of the earliest reports of gold mines was made by Father Jerome de Angelis, who visited the island of Yesso in 1620, and sent home glowing accounts of its riches in gold-washings.

The gold deposits of this large island were visited and surveyed in 1862 by the writer, together with Mr. Pumpelly, while in the service of the Tycoon's government. These gold mines are government property, and are worked on a limited scale. The gold region extends along the Kunui and Tusibets rivers, and in the range of mountains dividing Volcano bay from the west coast. There are also deposits in the territory of the Prince, or Daimio, Matsmai, and probably in the northern portions and interior of the island, as yet but little known, even to the Japanese. The government works consist merely of washings, no veins having yet been found, and the annual product cannot exceed $25,000 at the highest estimate. The gold is in fine scales, and occurs in the gravel of the flats and bars along the streams, resting upon the bed-rock exactly as in other gold regions. The river drift is coarse and heavy, and the deposits are deep. The gold is also found in high terrace deposits on the hill-sides, where the drift is also very coarse and heavy and the gold coarser than in the river. In some of the fine placer gold from this region the writer found a very fine but heavy white sand, consisting of minute white zircons, similar to some found in the gold region of North Carolina. Not only these deposits, but the best of the lower placers, have been worked over by miners of whom there does not appear to be any

[1] Origin of the Riches of Japan, translated by Klaproth, Noveau Journal Asiatique, ii.
[2] Three years in Japan, American edition, ii, p. 347.

history, although some of the Japanese think that the work was done by some of the former heads of the house of Matsmai, some 300 years ago. The trees standing in the old pits are at least of that age. To work these old placers, ditches were cut for many miles, exactly similar to those in use in California, and the deposits appear to have been very systematically and thoroughly washed.

The present system of washing is by a kind of ground sluicing, aided by straw mats, upon which the pay gravel is drawn by the workman with a hoe, and the current washes off the lighter sand and gravel, leaving the gold upon the mat. No board sluices, toms, or quicksilver were used, and these American adjuncts of placer mining were introduced there for the first time in 1862.

There are no doubt gold-bearing veins at the head-waters of the streams, but the dense growth of the cane, or dwarf bamboo, of the country rendered explorations, without cutting roads, almost impossible.

Gold also occurs in other parts of the empire of Japan, but it is difficult to obtain any precise or satisfactory information about the localities. On the islands of Sado, off the northwest coast, there are extensive mines upon a large vein of mixed silver and gold ore, very closely resembling the best of the ore from the Comstock vein, Nevada. This locality has evidently furnished a large amount of the precious metals, but the facts regarding it are very jealously guarded by the Japanese.

Some of the placer gold of Japan was represented in the miscellaneous collection of Japanese minerals at the Exposition.

COCHIN-CHINA, INDIA, AND OTHER COUNTRIES IN ASIA.

Gold is reported to exist in the sands of the rivers of Cochin-China, and to be extremely pure, but the working of the mines was formerly prohibited.

THIBET.

Gold exists in Thibet, but the mines are the exclusive property of the government. The total production was estimated by Jacob, in 1831, at certainly not over 10,000 ounces annually.

INDIA.

Over 12,000 persons are said to have formerly been engaged in gold washing in Assam, and the production amounted to 30,000 ounces annually. A mine called Pakergusi, at the junction of the Brahmapootra with the Dontriri, is said to have been worked for a short time each year, and 1,000 men were employed.[1] Gold has been procured from the coast of Malabar, and in the country to the west and southwest of the Neelghery mountains. According to Mr. Baber, who gave evidence on the subject before the British House of Commons, the auriferous district extends over 2,000 square miles. It was but slightly worked, and only by slaves.

CEYLON, SUMATRA, BORNEO.

Ceylon is said to have formerly yielded considerable gold, but in 1830 the production had ceased. In Sumatra gold is not only found in the

[1] Jacob, ii, p. 330.

streams, but in veins in the mountains of Monaugkabo. Jacob (1831) states that the several districts of the island were reported to produce about 13,000 ounces of gold, 19 carats fine. Most of this was used for ornamental purposes, chiefly for gilding.

In Borneo an abundance of gold has long been known to exist. It was obtained chiefly by Chinese and natives, from placer deposits, in a district between Samboss and Pontiana. The number of Chinese so employed was estimated at about 9,000 previous to 1831. The production from that district was estimated at over 88,000 ounces annually, and from the whole island at 120,000 ounces.

According to Kloos[1] the metal is spread in greater or less quantity over the whole island. Upon the borders of the river Kapoea placer gold is found associated with iron ores, sulphuret of antimony, and diamonds. Near Boedoek gold-bearing quartz veins traverse argillaceous schist. The metal is associated with pyrites and with tellurium. A vein of such ore, nearly vertical, and over six feet thick is worked near Montrado. Gold is also found at Kattoe-Koladi, in a clay filling the cavities of limestone. At Janah-Laute the gold is associated (in a placer) with platinum and osmiridium.

CELEBES AND THE PHILIPPINE ISLANDS.

Gold is found in the beds of the rivers of Celebes, and formerly 10,000 ounces were produced each year. The Philippine islands formerly yielded about 15,000 ounces of gold annually.

Jacob, from whose work most of the foregoing notes upon the production of gold in the East Indies are taken, estimated (1831) the total annual production of Asia, including China and Japan, at not over 380,000 ounces of gold and 260,000 ounces of silver, and valued it at about £1,300,000 sterling.

In the 20 years from 1810 to 1829 the treasure, chiefly gold, sent from Europe to India amounted to £7,314,388 sterling.

AFRICA.

According to Russegger, who travelled through Nubia in 1838, the mountain chain which stretches across the interior of Africa from east-northeast to west-southwest, and the streams which flow from it, are auriferous. In Sennaar and southern Abyssinia gold occurs in placer deposits and in quartz veins traversing granite, gneiss, and chloritic slates.

The mines of Bambouk, south of the Senegal, are considered as the most important of Africa, and are the source of the greater portion of the gold which reaches the coast. Another gold district is at Kordofan, on the upper Nile, between Darfour and Abyssinia. Gold is also collected in small quantities opposite Madagascar. Jacob states that there is no

[1] Berg und Hüttenm. Zeitung, 1865, p. 283, noticed by Delesse, Annales des Mines, vol. x, 1866, p. 594.

way in which an accurate estimate can be formed of the gold produced in Africa, and at that time he regarded the accounts furnished by the late African Company as the best available information. These included statements of the gold taken to England by ships of war, which conveyed the largest portion, on account of the greater security and lower rates of insurance. From this source it appears that the whole quantity so imported from the year 1808 to 1818, inclusive, amounted to 81,905 ounces. Of this, 51,569 ounces were valued at £205,344, and in the following four years of peace 30,569 ounces, valued at £125,380.[1]

The existence of an extensive gold field in South Africa has recently been announced. It is said to be in the Moselikatze country, about 700 miles from Durbau, the port of Natal.

Birkmyre estimates the annual production of gold in Africa at 4,000 pounds. Dusgate places it at 3,744 pounds.[2] If we accept the former estimate, and consider the gold worth between $18 and $19 per ounce, the value of the production is about $900,000 annually.

RÉSUMÉ OF THE TOTAL PRODUCTION OF GOLD IN THE YEAR 1867.

The value of the present total production of gold is shown approximately by the following tabular statement. The statistics of the principal gold-producing regions have been obtained up to 1867. Those from California and other portions of the United States include the returns to 1868. In many cases where the returns from several countries could not be obtained up to 1867, the average production at the date of the latest returns has been taken as the basis of an estimate of the production at the present time. Thus, no returns of the production of New Zealand have been received for the years since 1864, and its yield for 1867 is estimated at $6,000,000. In respect to the colony of New South Wales, noticed on page 87, some later returns have been received, and they appear to give the exports of *uncoined* gold, while the table on page 87 includes the shipments of coin. The last received table is annexed, and has been used as the basis of estimate of the yield of the colony for 1867:

Exports from New South Wales to 1867.

Year.	Exportation.	Year.	Exportation.	Year.	Exportation.	Year.	Exportation.
	Ounces.		*Ounces.*		*Ounces.*		*Ounces.*
1851	161, 880	1855	107, 250	1859	293, 574	1863	422, 722
1852	199, 500	1856	134, 950	1860	355, 328	1864	314, 351
1853	173, 960	1857	148, 126	1861	403, 139	1865	279, 121
1854	148, 900	1858	255, 535	1862	584, 219	1866	235, 893

[1] Jacob on Precious Metals, ii, 326.

[2] Cited by Phillips, p. 28.

In the following table it appears that the total gold product of the world, for the year 1867, was approximately $130,680,000. The last column shows the ratio of the production of each country to the total production. Thus, the United States produced nearly 43 per cent., Australia 23.78 per cent. and Russia 11 per cent. of the whole.

Approximate statement of the value of the production of gold in the principal gold-producing countries, (1867.)

Countries.	Value of production.	Totals.	Ratio per cent.
NORTH AMERICA.			
UNITED STATES.—California	$25,000,000		
Nevada	6,000,000		
Oregon and Washington	3,000,000		
Idaho	5,000,000		
Montana	12,000,000		
Arizona	500,000		
New Mexico	300,000		
Colorado	2,000,000		
Utah, Appalachians, and other sources, (estimated)	2,700,000		
		$56,500,000	43.23
BRITISH POSSESSIONS.—British Columbia, (estimated for 1867)	2,000,000		
Canada and Nova Scotia, ($551,660)	560,000		
		2,560,000	1.96
MEXICO, (estimated)	1,000,000		
		1,000,000	.76
CENTRAL AMERICA, SOUTH AMERICA, AUSTRALIA, AND NEW ZEALAND.			
SOUTH AMERICA.—Brazil, (estimate, based partly on returns for 1866)	1,000,000		
Chili, (estimated, in part)	500,000		
Bolivia, (estimated 1,600 lbs. troy,) about	300,000		
Peru, (estimated 2,400 lbs. troy,) about	500,000		
CENTRAL AMERICA.—Venezuela, New Grenada, Central America, Cuba and San Domingo, (estimated)	3,000,000		
		5,300,000	4.05
TRALIA.—Victoria, (1,392,336 ozs. in 1867)	26,510,000		
New South Wales, (estimate based on reported production of 235,893 ozs. in 1866)	4,500,000		
South Australia, (estimate based on returns for 1860)	140,000		
Queensland, (1866,) about	400,000		
		31,550,000	24.14
NEW ZEALAND.—(1864, $9,000,000. Estimated for 1867)		6,000,000	4.59
EUROPE, ASIA, AFRICA.			
Russia, (estimate based on average of 4 years, 1859 to 1864)		15,500,000	11.87
Austria, (1865)	1,175,000		
Spain, (estimated)	8,000		
Italy, (1866)	95,000		
France,[1] (in 1846 about $9,000)	80,000		
Great Britain, (about)	12,000		
Africa, (estimated)	900,000		
		2,270,000	1.74
Borneo and East Indies, (estimated)		5,000,000	3.83
China, Japan, Central Asia, Roumania, and other unenumerated sources, (estimated)		5,000,000	3.83
Total		130,680,000	100.00

[1] In part from jewellers' sweepings and refuse materials.

SILVER.

CHAPTER IV.

SILVER REGIONS OF THE UNITED STATES.

STATE OF NEVADA—EXTENT OF THE SILVER REGION AND TOTAL BULLION PRODUCT—PRINCIPAL DISTRICTS—COMSTOCK LODE—LIST OF CLAIMS—MACHINERY—COST OF MATERIALS—EXPENSES AND PRODUCTS OF THE GOULD AND CURRY MINE—AVERAGE YIELD OF ORES—PRODUCTION OF BULLION—REESE RIVER REGION—PRODUCTION OF MINES—EASTERN NEVADA AND DISTRICTS—CORTEZ DISTRICT—NYE COUNTY—ESMERALDA COUNTY—TABULAR STATEMENT OF THE RESULTS OF THE ASSAYS OF ORES SENT TO THE PARIS EXHIBITION—CALIFORNIA SILVER DISTRICTS—IDAHO—COLORADO—ARIZONA AND NEW MEXICO—ATLANTIC PORTION OF THE UNITED STATES, AND LAKE SUPERIOR.

STATE OF NEVADA.

The State of Nevada has an area of nearly 100,000 square miles, extending from longitude 37° to 43° west from Washington, and between the parallels of 37° and 43° north. The presence of veins of silver throughout this vast territory was comparatively unknown eight years ago, when, in 1859, the Comstock vein was discovered. The region was then regarded as an irredeemable wilderness, a land of deserts and death, over which the early pioneers had passed as rapidly as possible in the tide of emigration to the gold regions of California. The scene has changed. Nevada, from a comparatively unknown portion of Utah, became first a Territory and then a State in the Union. It has now a large population, and its principal centres are Virginia City, Austin, Carson, Aurora, and Dayton. The valleys and deserts resound with the shrill whistle of engines and the falling of stamps. The little valleys are brought into cultivation; graded roads are made over apparently impassable mountains; mails arrive and depart daily, and the telegraph connects the business centres with those on the Pacific and the Atlantic. All this has resulted chiefly from the discovery of the celebrated Comstock lode, which has already added nearly $80,000,000 in value to the bullion of the world.

From the Comstock the explorations extended in all directions, and resulted in the discovery of gold and silver-bearing veins in most of the principal mountain ranges that traverse the Great Basin in a general north and south direction. First, the metal was traced southward to Esmeralda, Mono, Coso, Walker's river, Owens river, and Slate range, near the southern end of the Sierra Nevada. Eastward, the Humboldt mines, Reese river, Goose creek, Egan cañon, and Utah mines, were reached in succession, and the discoveries have been extended eastward

to the ranges of the Rocky mountains, where the prospectors met those of Colorado. Northward, in connection with the gold prospectors of Oregon, the precious metals were traced into Idaho, Montana, and British Columbia, and southward, veins have been discovered along the ranges reaching into Arizona, extending the silver region to Sonora, thus connecting the whole with the great metalliferous belt of the Mexican plateau; and with the discoveries at the extreme north, proving a continuous zone of mineral wealth through North America, from Panama to the Arctic sea.

The excitement incident to the discovery and developments upon the Comstock was intense, and claims were located by thousands in all directions. As veins were discovered at a distance new districts were organized by the miners, each with their separate records, laws, and regulations, according to which locations were made and the claims worked. Veins bearing the precious metals have since been traced in nearly every part of the State, and it is difficult to enumerate even the districts that have been organized, and in which claims of greater or less value have been located. Nevada has become the great silver region of the world, and gives promise of an enormous production of the metal for a long time in the future.

TOTAL BULLION PRODUCT OF NEVADA.

It is difficult to obtain exact statistics of the total bullion product of the State, as the shipments from Austin, Aurora, and other points, are not reported at the end of each year as at the express offices at Virginia and Gold Hill. The Reese river region has generally been considered as producing about $1,000,000 per annum, and ore and bullion are now beginning to be received from the southern districts. The following figures are believed to present a close approximation to the annual and total yield of the State up to January 1, 1868. The greater part of this amount was obtained from the Comstock lode:

1859	$50,000
1860	300,000
1861	2,300,000
1862	6,500,000
1863	12,500,000
1864	16,000,000
1865	16,800,000
1866	16,500,000
1867	18,500,000
Total	$89,450,000

The ores from many of the principal districts were exhibited in the Exposition in the collections sent from California. The principal claims upon the Comstock were so represented, and in no other way. The

eastern portion of the State, including the mines about Austin and some districts south of it, were represented by a magnificent collection of their richest ores in large masses, under the superintendence of David E. Buel, esq. These ores weighed in the aggregate several tons, and were contributed by various mine owners to an executive committee for the representation.[1] Although they reached Paris at a late date (in July,) their value and importance was such as to gain them a place in the Exposition and a recognition by the Imperial Commission in the form of a silver medal.

The following brief notices of the principal mineral districts of the State have been compiled chiefly from the writer's notes and the statistical publications mentioned below,[2–7] to which reference may be made for further details.

STOREY COUNTY.

Virginia district—Comstock lode.—The first quartz claim was located in the Virginia mining district on the 22d of February, 1858, by James Finney, generally known as "Old Virginia," from whom the city of Virginia and the croppings have taken their name. In June, 1859, two men, while washing for gold below these croppings, made an excavation to hold water upon the hill-side, and uncovered rich silver ore upon the ground now belonging to the Ophir Company. A man named Comstock was employed to purchase the claim, and thus his name has been given to the vein. As soon as the true nature of this ore was ascertained, miners flocked into the Territory, and claims were located upon the supposed course of the vein for a distance of about six miles.

The subsequent developments have shown this vein to be one of the largest and richest ever discovered, ranking with the celebrated Veta Madre of Guanajuato, and the Veta Grande of Zacatecas, Mexico. It is evidently what is termed a true fissure vein, and may be followed to a depth which will be limited by the costs of mining rather than by the absence of vein.

The elevation of this vein above the sea is about 6,000 feet, and it

[1] This committee was composed of the following named gentlemen: Messrs. M. J. Goodfellow, B. J. Burns, E. A. Sherman, J. R. Murphy, W. F. Leon, W. H. Clark; and they were charged with the duty of preparing a "Descriptive Report to accompany the representation of Eastern Nevada at the Paris Exposition of the world's products."

[2] La Nevada Orientale, Géographie Ressources, Climat et Etat Social; Rapport addressé au Comité local pour l'Exposition de Paris, par Myron Angel. Paris: Juillet, 1867. [Distributed at the Exposition by David E. Buel, esq.]

[3] Annual Report of the State Mineralogist of the State of Nevada for 1866, addressed to the honorable the Board of Regents of the State, by R. H. Stretch, State Mineralogist.

[4] Langley's Pacific Coast Business Directory. 8vo; San Francisco, California: 1867.

[5] Nevada Territorial Directory. 1863.

[6] Review of the Mining, Agricultural, and Commercial Interests of the Pacific States for the year 1866. Compiled by J. H. Carmany. San Francisco: H. H. Bancroft & Company. 1867; 8vo.

[7] Annual Report of the Surveyor General of the State of Nevada for the year 1865.

comes to the surface on the eastern slope of a porphyritic mountain, which has been named Mount Davidson.[1] Its course or direction is nearly north and south, and its general dip or inclination is towards the east. In width it varies from a mere seam to over 200 feet, and it is often broken up into several parallel branches which include large masses of the "country" rocks. It is remarkable for its large selvages of clay, filled with broken portions of the vein and walls, much worn and rounded by the attrition to which they have been subjected by the movement of the adjoining surfaces. Only the harder, and, in general, the more barren parts of the vein show upon the surface as "croppings." These present an irregular, brecciated appearance, have a brown color, and afforded free gold to the first miners in some places. Some of the richest bunches of ore below are found to the eastward of the heaviest croppings, and, in general, the richest ore is quite soft and granular, being broken up so as to resemble crushed sugar or salt. A mass of quartz of this kind, over 30 feet wide, in the Ophir mine, in 1861, was found to be impregnated with sulphide of silver, stephanite, and native silver and gold. A harder stratum or layer of the vein contained galena, blende, and iron pyrites.

Excavations along the line of the vein have extended by shafts to a depth of 700 to 800 feet. Several long tunnels have been run to drain the vein, the principal one being the Latrobe, commenced in 1861, and now about 3,200 feet long, which drains the mines at the north end of the lode to a depth of about 600 feet. A new tunnel, to be 20,278 feet long, and to drain the lode to a depth of 2,000 feet, is projected by Mr. A. Sutro. It is estimated that this work will occupy three or four years for its construction, and cost about $2,000,000.

The principal mining upon this vein is at Gold Hill and Virginia City, within a linear distance upon the vein of less than 8,000 feet, but explorations have been made over a length of about four miles and the existence of the vein proved. The following tabular statement gives the names of the different claims upon the line of the vein, in the order of their succession from the north southward, with the length of each in feet, the depth to which they have been worked, and other data:[2]

[1] After Donald Davidson, esq., of San Francisco, one of the first to ascend it.

[2] This table is extracted from the report of Mr. R. H. Stretch, Nevada State Mineralogist; 1866.

Table of mining claims on the Comstock lode.

Name.	Length of claim in feet.	Length explored in feet.	Per cent. of claim explored.	Depth of lowest workings.	Height of top of shaft above proposed Sutro tunnel.	Remarks.
.....	1,000	300	30	260	.....	Engine removed; not working.
.....	925	300	32	200	.....	Not working.
vada.....	1,959	400	25	650	1,796	
.....	500	5	1	80	.....	Explored by tunnel; not working.
rth mine.....	1,200	400	33⅓			
.....	100	100	100	549	1,887	Explored through Ophir and Mexican shaft.
ith mine.....	200	200	100			
.....	150	150	100	620	1,898	
.....	300	300	100	428	.....	Explored by tunnel and winzes.
No. 2	100	100	100	369	.....	Explored by whim on White & Murphy claim, and by the Latrobe tunnel; not working.
.....	50	5	10	369	.....	
d Murphy	210	210	100	369	1,954	
.....	500	200	40	500	1,955	Not working.
elcher	250	250	100	469	1,954	Not working; engine removed.
Curry	1,200	921	100	900	1,800	
ld shaft	771	771	100	614	1,954	
urtis shaft.....	.....	.....	.....	448	1,787	
orcross.....	400	400	100	783	1,963	
otosi	1,434	700	50	923	1,832	
.....	940	450	47	800	1,913	
r	400	.....	100	540	1,819	
.....	278½	278½	100	680	1,800	
Bates.....	31½	31½	100	.....	.....	Average depth of workings 650 feet. [1866.]
(Alta)	118	118	100	.....	1,761	
.....	45	45	100	.....	.....	
orth mine.....	55	55	100	.....	1,763	
.....	30	30	100	.....	1,761	
.....	20	20	100	.....	.....	
outh mine.....	20	20	100	.....	.....	
.....	10	10	100	.....	.....	
.....	20	20	100	.....	.....	
.....	20	20	100	.....	.....	
Kustel.....	30	30	100	.....	.....	
ed.....	21	21	100	.....	.....	
nd.....	13½	13½	100	.....	.....	
(H. & L.)	65⅔	65⅔	100	.....	.....	
.....	50	50	100	.....	1,734	
e	130	130	100	.....	1,725	
Hamilton.....	40	40	100	.....	.....	
cket.....	943	943	100	560	1,567	
.....	93⅜	93⅜	100	460	1,543	
int	540	540	100	400	1,517	
.....	940	940	100	850	1,585	
l Belcher	160	160	100	500	1,570	
.....	1,200	700	60	711	1,606	
erican	2,000	.....	.....	300	1,620	
American	2,000	500	25	300	.....	Not working.

of these claims are worked by incorporated companies with capi-
ished from California. The engines, machinery and supplies are
ed over the Sierra Nevada at a heavy cost, now being rapidly
d as the Pacific railroad is pushed forward.

The above enumerated companies had excavated, before 1866, about 28 miles of tunnels and drifts, and about five and three-quarters miles of shafts, winzes, and inclines, exclusive of stopes. The dead work of one mine alone, the Gould & Curry, was in 1865 about 12,750 lineal feet of shafts and tunnels.[1]

The following table shows the number and power of the hoisting and pumping engines at work on the lode in 1866:[2]

Pumping and hoisting engines on the Comstock lode.

Company.	Hoisting engines.		Pumping engines.		Pumping and hoisting engines.	
	Number.	Horse power.	Number.	Horse power.	Number.	Horse power.
Allen	.....	.....	.....	.....	1	30
Sierra Nevada	1	60	1	200	.....	.....
Ophir, (Mexican)	1	60	1	200	.....	.....
Central	.....	.....	.....	.....	1	.....
Sides	.....	.....	.....	.....	1	50
Gould & Curry	2	60	1	150	.....	.....
Savage, (old shaft)	1	60	.....	.....	.....	.....
Savage, (new shaft)	3	60	1	300	.....	.....
Hale & Norcross	.....	.....	.....	.....	1	.....
Potosi	1	.....	.....	.....	.....	.....
Chollar-Potosi	1	.....	1	.....	.....	.....
Bullion	.....	.....	.....	.....	2	.....
Exchequer	.....	.....	.....	.....	1	60
Alpha	.....	.....	.....	.....	1	.....
Imperial	.....	.....	.....	.....	1	.....
Empire	.....	.....	.....	.....	2	30
Eclipse	.....	.....	.....	.....	2	30
Winters & Kustel, consolidated	.....	.....	.....	.....	2	20
Challenge	.....	.....	.....	.....	1	35
Confidence	.....	.....	.....	.....	1	25
Yellow Jacket	.....	.....	.....	.....	2	.....
Kentuck	.....	.....	.....	.....	1	.....
Belcher	.....	.....	.....	.....	2	.....
Segregated Belcher	.....	.....	.....	.....	2	60
Overman & Sam	2	30	2	40	.....	.....
North American	.....	.....	.....	.....	1	.....
Baltimore American	.....	.....	.....	.....	1	.....

There are 76 mills, or reduction establishments, supplied by ores from the Comstock lode. These are scattered through Storey, Lyon, Ormsby, and Washoe counties. For details, reference is made to the annexed table of quartz mills in the State. The value of the mills and machinery of Storey county alone is estimated at $3,500,000.

The mills are expected to return in bullion 65 per cent. of the assay value of the pulp, which is about the average working result. There is thus a loss of 35 per cent., or about $8,000,000 annually. The cost of

[1] Report of S. H. Marlette, surveyor general.

[2] Report of State mineralogist, 1866.

working ordinary ores is from $12 to $15 per ton. A few years ago $20 and $25 per ton were paid for working. One chief element of this great expense of reduction is the cost of fuel, which is scarce in the region and commands from $15 to $20 per cord. A dwarf pine, the *piñon*, is chiefly used and is hauled a distance of 10 or 12 miles. The annual consumption of fire-wood is estimated at 144,000 cords, and is valued at nearly $2,000,000.

The lumber is brought from the Sierra Nevada, some 12 miles distant, where the supply is practically inexhaustible. The annual consumption is estimated at 35,000,000 feet board measure, worth about $1,400,000, one-half of which is for freight. Water for the mills on the lode, and for the cities of Virginia and Gold Hill, is obtained chiefly from tunnels run into the side of the mountains above, where a large and porous quartz vein, comparatively free from ores, (the Santa Rita) gives an unfailing supply. Considerable water is also obtained from the Ophir mine and other deep shafts, and from the Latrobe tunnel.

The details of the costs of mining and of working silver ores have great practical importance, and I have, therefore, devoted considerable space to their presentation, particularly as the well arranged reports of Mr. Janin, Mr. Bonner, and other superintendents afford such rich and reliable materials. In the report of the Gould & Curry Silver Mining Company for 1865 a comparative statement of the product of the mine for the years 1862, 1863, 1864, and 1865, shows the average value of the ores that were worked, the costs of mining and of reduction at the mill belonging to the company and at custom mills. The statement is as follows:

Comparative statement of the product of the Gould & Curry mine for the years 1862, 1863, 1864, *and* 1865.

Year.	Tons produced.	1st class.	2d class.	3d class.	Average value of ores worked.	Cost of mining.	Cost of working at G. & C. mill.	Cost of working at custom mills.
1862....	8,442½	*15½	.....	8,427	†$104 50	$12 54	.....	$38 55
1863....	48,743½	*24½	4,812	43,907	80 44	12 64	$38 00	22 30
1864....	64,433	*10½	8,821	55,602	73 48	12 00	40 00	26 00
1865....	47,217	1½	470	46,745	45 41	10 84	12 93	20 36

* Shipped to England. † Third class ore.

It is observed that the proportion of profit increases with the richness and decreases with the poverty of the ores; thus ore yielding $75 per ton gives more than twice as much profit as $45-ore, although not twice as rich.

The costs of working mines and ores in this region are well elucidated by the following tabular statements of the quantity and cost of materials used at the Gould & Curry mine and mill during the year 1866.[1]

[1] Report State Mineralogist Nevada, p. 91.

Cost of materials for working mines and ores in Nevada.

Articles.	Quantity.	Cost.	Averag
Wood ..... cords..	11,442	$168,830 00	
Lumber ..... feet...	172,857	3,725 00	
Shingles	21,500	185 00	
Charcoal ..... bushels.	5,848	1,659 00	
Iron ..... pounds.	12,639	1,698 00	
Gas pipe ..... do ...	450	258 00	
Castings ..... do ...	395,099	33,880 00	
Rivets, nuts, &c ..... do ...	853	175 00	
Steel ..... do ...	1,253	315 00	
Copper ..... do ...	178	142 00	
Babbit metal ..... do ...	262	120 00	
Nails ..... do ...	3,832	417 00	
Zinc ..... do ...	172	42 00	
Turpentine ..... gallons.	25	72 00	
Belting ..... pounds.	2,888	2,192 00	14 t
Packing ..... do ...	494	497 00	
Rope ..... do ...	393	96 00	
Hose ..... do ...	136	97 00	.....
Sulphate of copper ..... do ...	87,353	17,588 00	
Salt ..... do ...	345,668	10,943 00	
Lard oil ..... gallons.	1,360	2,487 00	
Kerosene ..... do ...	985	1,615 00	
Linseed ..... do ...	40	99 00	
Quicksilver ..... flasks..	675	35,013 00	
Cut bolts ..... pounds.	923	214 00	
Screens ..... do ...	743	633 00	
Candles ..... do ...	2,980	819 00	
Axes and handles	71	67 00	.....
Picks	42	20 00	
Shovels	239	231 00	
Feed ..... sacks..	487	2,087 00	.....
Hay ..... bales..	196	1,120 00	.....
Axle grease	116	58 00	
Copper rivets ..... pounds.	280	280 00	
Tallow ..... do ...	10,863	1,361 00	
Alcohol ..... gallons.	15	60 00	
Brooms	189	147 00	
Oakum ..... pounds.	126	46 00	
Sledge handles	157	77 00	
Lamp chimneys	531	174 00	
Hoes	76	71 00	
White and red lead	1,241	242 00	
Blankets	43	347 00	
Leather	575	246 00	
Stone coal	9,751	714 00	†
Water	.....	6,835 00	.....
Sundries	.....	3,833 00	.....
Total	.....	$301,927 00	.....

* Per thousand feet. † Per ton.

The consumption and cost of these materials at the mine and mill distributed as shown by the following valuable detailed statements the Annual Report of the superintendent and secretary of the comp The succeeding tables show the quantity and value of ore amalgam and the value of bullion produced, with the cost of production per of ore:

Gould & Curry mine operations and expenses.

[From the Annual Report of the Gould & Curry Silver Mining Company; Louis Janin, jr., superintendent; David Bowie, secretary.]

Months.	Officials.	Extracting ore.	Prospecting and dead work.	Accessory work.	Improvements.	Total.	Ore produced.			Ore shipped.	
							Tons.	Pounds.	Cost per ton.	Tons.	Pounds.
1865.											
December	$1,216 00	$19,833 41	$9,396 77	$10,824 67	$6,743 45	$48,014 30	5,886	1,500	$8 15	6,656	1,670
1866.											
January	1,221 00	20,919 21	10,290 19	10,210 58	3,162 08	45,797 06	6,108	.....	7 50	5,979	1,690
February	1,158 00	15,032 35	10,946 94	8,344 92	3,180 75	38,662 96	4,940	500	7 82	5,188	500
March	1,035 00	15,870 69	13,696 93	8,622 14	2,644 00	41,868 76	5,141	1,000	8 14	5,355	1,550
April	1,055 00	16,108 48	13,205 65	9,378 33	2,108 77	41,856 23	5,167	.....	8 10	4,816	1,940
May	1,081 00	15,284 85	11,094 56	8,927 74	2,037 47	38,425 62	4,662	.....	8 24	5,059	1,235
June	1,080 00	13,412 17	10,095 61	9,264 90	2,486 87	36,339 55	4,126	500	8 80	3,831	1,580
July	1,101 00	11,779 78	12,384 43	6,725 66	4,054 48	36,045 35	3,940	.....	9 15	4,064	.....
August	1,101 00	15,533 69	12,244 01	9,914 34	1,768 49	40,561 53	5,348	.....	7 58	5,019	.....
September	1,060 00	15,582 15	12,676 88	9,315 36	2,462 07	41,096 46	5,951	.....	6 90	5,408	.....
October	1,086 00	18,217 02	7,525 93	11,616 11	3,884 93	42,329 99	5,703	929	7 42	5,783	350
November	1,060 00	16,254 92	8,139 19	10,701 71	3,968 89	40,124 71	5,450	1,500	7 36	4,761	1,414
Total	$13,254 00	$193,822 72	$131,697 09	$113,846 46	$38,502 25	$491,122 52	62,424	1,929	.....	61,924	1,929
Average per ton	$0 21	$3 10	$2 11	$1 82	$0 62	$7 86	.....	.....	.....	.....	.....

Detailed statement of cost at the Gould & C

Description.	1865.	1866.			
	December.	January.	February.	March.	Ap
Officers, general labor, watchmen, teamsters, &c.	$2,446 88	$2,414 75	$2,399 88	$2,212 62	$2,
DRIVING POWER.					
Labor	$1,834 25	$1,872 25	$1,677 25	$1,813 37	$1,
Wood	14,219 00	13,620 00	11,579 00	15,619 00	13,
Sundries	494 00	442 00	291 00	480 00	
Total	$16,547 25	$15,934 25	$13 547 25	$17,912 37	$15,
PREPARING ORE FOR BATTERIES.					
Labor	$1,648 12	$1,552 25	$1,466 25	$1,677 74	$1,
Sundries	.....	.....	.....	521 00	
Total	$1,648 12	$1,552 25	$1,466 25	$2,198 74	$1,
BATTERIES.					
Labor	$2,570 00	$2,470 00	$2,344 50	$2,502 00	$2,
Castings	1,073 00	811 00	536 00	969 00	
Sundries	331 00	227 00	339 00	302 00	
Total	$3,974 00	$3,508 00	$3,219 50	$3,773 00	$3,
AMALGAMATING.					
Labor	$2,654 88	$2,558 75	$2,526 25	$2,687 25	$2,
Retort wood	200 00	219 00	160 00	320 00	
Castings	2,253 00	1,933 00	1,106 00	2,945 00	2,
Salt	1,043 00	1,131 00	1,121 00	1,181 00	
Sulphate of copper	1,948 00	2,138 00	2,572 00	2,863 00	1,
Quicksilver	2,850 00	3,000 00	2,964 00	2,754 00	2,
Sundries	398 00	362 00	349 00	376 00	
Total	$11,346 88	$11,341 75	$10,798 25	$13,126 25	$9,
REPAIRS.					
Labor	$2,539 12	$2,804 75	$2,751 75	$2,677 61	$2,
Sundries	2,901 00	2,295 00	1,912 00	3,173 00	2,
Total	$5,440 12	$5,099 75	$4,663 75	$5,850 61	$5,
TOTAL COST.					
Labor	$13,693 25	$13,702 75	$13,165 88	$13,570 59	$12,
Material	27,710 00	26,178 00	22,929 00	31,503 00	25,
Hauling ore from mine	3,010 29	2,744 10	3,093 07	3,299 58	3,
Grand total	$44,413 54	$42,624 85	$39,187 95	$48,373 17	$40,

[1] From the Annual Report of the Gould & Curry Silver Mining Comp

mill for the year ending November 30, 1866.[1]

1866.

May.	June.	July.	August.	September.	October.	November.	Total.
$2,559 25	$2,778 50	$2,495 25	$2,575 50	$2,352 00	$2,315 25	$1,969 75	$28,841 13
$1,714 25	$1,688 25	$1,645 12	$1,703 00	$1,648 75	$1,707 00	$1,616 50	$20,574 49
17,630 00	12,481 00	11,959 00	11,774 00	11,370 00	13,268 00	14,010 00	160,858 00
388 00	517 00	485 00	376 00	394 00	341 00	321 00	5,052 00
$19,732 25	$14,686 25	$14,089 12	$13,853 00	$13,412 75	$15,316 00	$15,947 50	$186,484 49
$1,279 62	$1,274 25	$1,328 00	$1,278 75	$1,378 00	$1,256 00	$1,282 25	$16,710 48
36 00	67 00	70 00	111 00	66 00	69 00	139 00	1,350 00
$1,315 62	$1,341 25	$1,398 00	$1,389 75	$1,444 00	$1,325 00	$1,421 25	$18,060 48
$2,138 00	$1,933 12	$2,117 25	$2,148 37	$2,106 00	$2,037 00	$2,069 87	$26,677 99
370 00	464 00	839 00	563 00	836 00	463 00	723 00	8,434 00
407 00	316 00	424 00	326 00	373 00	381 00	379 00	4,201 00
$2,915 00	$2,713 12	$3,380 25	$3,037 37	$3,315 00	$2,881 00	$3,171 87	$39,312 99
$2,517 00	$2,238 75	$2,664 75	$2,794 50	$2,730 50	$2,493 37	$2,714 00	$31,057 00
232 00	264 00	.....	192 00	....	62 00	.....	1,881 00
1,468 00	910 00	3,288 00	1,600 00	2,482 00	1,388 00	2,296 00	24,001 00
701 00	517 00	557 00	1,079 00	1,168 00	710 00	1,118 00	10,943 00
1,518 00	1,159 00	966 00	995 00	916 00	527 00	769 00	17,588 00
3,605 00	2,777 00	2,983 00	3,629 00	3,056 00	2,082 00	2,664 00	35,013 00
357 00	321 00	478 00	310 00	317 00	365 00	391 00	4,414 00
$10,398 00	$8,186 75	$10,936 75	$10,599 50	$10,669 50	$7,627 37	$9,952 00	$124,897 00
$2,807 50	$2,779 62	$2,604 37	$2,985 87	$2,713 37	$3,068 62	$3,427 37	$34,003 70
2,825 00	1,896 00	1,895 00	2,359 00	1,756 00	2,259 00	2,459 00	28,016 00
$5,632 50	$4,675 62	$4,499 37	$5,344 87	$4,469 37	$5,327 62	$5,886 37	$62,019 70
$13,015 62	$12,692 49	$12,854 74	$13,485 99	$12,928 62	$12,877 24	$13,079 74	$157,864 79
29,537 00	21,689 00	23,944 00	23,314 00	22,734 00	21,915 00	25,269 00	301,751 00
3,365 56	2,691 32	3,233 48	3,169 73	3,309 16	2,522 31	2,793 15	36,389 13
$45,918 18	$37,072 81	$40,032 22	$39,969 72	$38,971 78	$37,314 55	$41,141 89	$496,004 92

Louis Janin, jr., superintendent; David Bowie, secretary.

Quantity and value of ore amalgamated at the Gould & Curry mill, and value of bullion produced, in one year ending Nov. 30, 1866.

Month.	Ores.		Assay per ton.	Value of ores.	Bullion produced.*		
	Delivered to mill.	Amalgamated.			Gold.	Silver.	Total.
	Tons. Pounds.	*Tons.*					
1865—December	3,344 1,535	3,138	$40 64	$127,516 52	$27,303 19	$63,113 39	$90,416 58
1866—January	3,049 15	2,744	42 10	115,537 80	23,186 22	61,005 13	84,191 35
February	3,436 1,465	2,960	41 64	123,275 95	30,223 74	70,020 46	100,244 20
March	3,666 395	3,055	56 44	172,438 84	39,667 22	98,315 48	137,982 70
April	3,508 405	2,908	47 90	139,317 82	33,251 75	82,799 53	116,051 28
May	3,739 1,030	3,085	47 73	147,276 40	43,721 02	87,141 72	130,862 74
June	2,990 715	2,601	48 35	125,780 96	29,143 82	63,007 28	92,151 10
July	3,592 1,500	3,181	34 97	111,239 67	26,148 18	58,781 81	84,929 99
August	3,521 1,850	3,135	42 53	133,331 55	31,637 56	70,869 57	102,507 13
September	3,676 1,695	3,232	37 24	120,359 68	27,510 41	63,931 12	91,441 53
October	2,802 1,135	2,902	33 42	96,984 84	17,182 91	39,377 43	56,560 34
November	3,103 1,015	3,660	45 29	169,187 40	34,827 90	66,914 93	101,742 83
Total	40,432 755	36,001	.....	$1,582,247 43	$363,803 92	$825,277 85	$1,189,081 77

Cost of working per ton of ore.

	Labor.	Silver.	Castings.	Sulphate copper.	Salt.	Quicksilver.	Sundries.	Total.
General foreman, watchmen, laborers, &c.	$0 71.33	.....	.....	.....	.....	.....	.....	$0 71.33
Driving power	50.88	$3 97.84	.....	.....	.....	.....	$0 12.49	4 61.21
Preparing ore for batteries	41.32	.....	.....	.....	.....	.....	3.33	44.65
Batteries	65.98	.....	$0 20.85	.....	.....	.....	10.39	97.22
Amalgamating	76.81	4.65	59.36	$0 43.50	$0 27.06	$0 86.59	10.96	3 08.93
Repairs	84.10	.....	.....	.....	.....	.....	69.31	1 53.41
Hauling ore to mill	.....	.....	.....	.....	.....	.....	90.00	90.00
Total	$3 90.42	$4 02.49	$0 80.21	$0 43.50	$0 27.06	$0 86.59	$1 96.48	$12 26.75

*656 bars, Nos. 2,889 to 3,546.

The average cost of extraction per ton of ore, including prospecting and dead work and improvements, is thus shown to be $7 86, and the average cost of working the ore per ton $12 26.

The following shows the average contents, yield, and loss per ton:

Average assay, per ton	$43 95
Average yield, per ton	33 02
Loss, per ton	10 93
Cost per ton for amount of ore crushed	12 26.75
Cost per ton for amount of ore amalgamated	13 77.78

The difference between amount of ore crushed and amalgamated shows loss in slimes and the moisture contained in the ore:

Estimated amount of slimes in reservoirs..... 3,500 tons.
Estimated profit in working slimes..... $12 50 per ton = $43,750.

The following table exhibits the total ore and bullion product of the Gould & Curry mine, the average yield per ton, and the dividends paid, from the date of the incorporation of the company (June 27, 1860) to November 30, 1866:[1]

Product of the Gould & Curry mine to December, 1866.

Date.	Ore worked, &c.	Bullion, &c.	Average yield per ton.	Dividends paid.
	Tons.			
From July 1, 1860, to December 13, 1860	140½	$22,004 82	$156 62	.....
From December 14, 1860, to December 13, 1861	300	44,221 41	147 40	.....
From December 14, 1861, to November 30, 1862	8,442½	842,538 80	99 80	.....
From December 1, 1862, to November 30, 1863	48,745	3,902,712 64	80 07	$1,468,800
From December 1, 1863, to November 30, 1864	66,477½	4,798,124 90	72 18	1,440,000
From December 1, 1864, to November 30, 1865	46,022½	2,026,172 57	44 02	618,000
From December 1, 1865, to November 30, 1866	60,417½	1,690,952 25	28 00	252,000
Total	.....	$13,326,727 39		
From tailings	.....	300,143 76		
Worked ..... tons	230,546	$13,626,871 15	$59 02	$3,778,800
On hand December 1, 1866 ..... do	4,249½			
Total product	234,795½			

The average yield of the ores worked from the Comstock lode is further shown by the following data from the principal mines:

Mine.	Tons reduced.	Average yield.
Hale & Norcross	22,626	$46 65
Savage	29,535	42 38
Crown Point	33,377	38 15
Gould & Curry	(2) 230,546	59 02
Empire	19,750	24 69
Ophir	11,163	42 50

[1] Carmany's Review, page 56. [2] Average from July 1, 1860, to November 30, 1866.

Assessments of Washoe mining companies.

Company.	During the year 1867.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Alpha											$12,000		$12,000
Bacon													
Baltimore American	$5,200												5,200
Belcher	15,600		$12,480			$15,600			$15,600			$15,600	74,880
Bullion		$25,000			$25,000	25,000	$37,500			$25,000			137,500
Chollar-Potosi												42,000	42,000
Central													
Confidence		39,000		$15,600		15,600							70,200
Crown Point										60,000			60,000
California						30,600							30,600
Daney	4,000			4,000		24,000			12,000				44,000
Exchequer												16,000	16,000
Gould & Curry									120,000				120,000
Hale & Norcross												60,000	60,000
Justice and Independent							15,000		30,000				45,000
Lady Bryan													
Ophir	84,000						50,400		50,400				184,800
Overman			32,000										32,000
Segregated Belcher								$6,400					6,400
Sides	1,500					12,500							14,000
Sierra Nevada		12,000		12,000		30,000			30,000			12,000	96,000
White & Murphy							5,670						5,670
Yellow Jacket										120,000	120,000		240,000
Total	$110,300	$76,000	$44,480	$31,600	$25,000	$153,300	$108,570	$6,400	$258,000	$205,000	$132,000	$145,600	$1,296,250

Assessments of Washoe mining companies—Continued.

Company.	During the year 1866.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Alpha		$36,000		$60,000									$96,000
Bacon								$9,000			$9,000		18,000
Baltimore American			$5,200		$7,800								13,000
Belcher			62,400				$46,800			$34,320			143,520
Bullion	$25,000	25,000	25,000	25,000			25,000		25,000		25,000		175,000
Chollar-Potosi													
Central							9,000						9,000
Confidence				39,000									39,000
Crown Point													
California													
Daney		4,000		4,000		$6,000		6,000		6,000			26,000
Exchequer			16,000			16,000							32,000
Gould & Curry													
Hale & Norcross													
Justice and Independent													
Lady Bryan	5,000		5,000		5,000								15,000
Ophir										100,800		84,000	184,800
Overman	32,000	48,000			32,000			48,000		15,000		32,000	208,000
Segregated Belcher													
Sides													
Sierra Nevada		6,000		12,000		6,000		12,000		7,500		12,000	55,500
White & Murphy													
Yellow Jacket		180,000											180,000
Total	$62,000	$299,000	$113 600	$140,000	$44,800	$28,000	$80,800	$75,000	$25,000	$164,620	$34,000	$128,000	$1,194,820

During 1867 the companies mining on the Comstock lode declared dividends to the amount of four millions of dollars. The dividends for 1866 were only $1,754,400, showing an increase of $2,245,600. In 1867 the assessments levied by twenty companies reached $1,296,250, against $1,194,820 levied by fourteen companies in 1866.

Dividends of the leading claims on the Comstock lode.

DURING THE YEAR 1867.

Company.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Per share.
Savage	$80,000	$80,000	$80,000	$80,000	$120,000	$160,000	$240,000	$200,000	$200,000	$120,000	$120,000	$120,000	$1,600,000	$100 00
Hale & Norcross	40,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	.....	.....	.....	440,000	550 00
Imperial	32,000	48,000	60,000	60,000	60,000	40,000	40,000	40,000	.....	.....	.....	.....	380,000	95 00
Yellow Jacket	60,000	.....	.....	.....	60,000	90,000	90,000	.....	.....	.....	.....	.....	300,000	250 00
Chollar-Potosi	.....	.....	.....	.....	70,000	70,000	70,000	70,000	70,000	70,000	.....	.....	420,000	150 00
Kentuck	10,000	20,000	30,000	40,000	40,000	60,000	80,000	80,000	50,000	50,000	15,000	30,000	505,000	252 50
Crown Point	60,000	60,000	48,000	48,000	48,000	.....	.....	.....	.....	.....	.....	.....	264,000	110 00
Gold Hill Quartz M. & M. Company	.....	.....	.....	5,000	5,000	5,000	7,500	7,500	.....	.....	.....	3,750	33,750	67 50
Empire Mill & M. Co.	12,000	18,000	12,000	.....	7,200	.....	.....	.....	.....	.....	.....	.....	49,200	41 00
Gould & Curry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	$294,000	$276,000	$280,000	$283,000	$460,200	$475,000	$577,500	$447,500	$370,000	$240,000	$135,000	$153,750	$3,991,950	.....

DURING THE YEAR 1866.

Savage	.....	.....	.....	.....	.....	.....	$40,000	$40,000	$40,000	$60,000	$60,000	$80,000	$320,000	$20 00
Hale & Norcross	.....	.....	.....	$20,000	$20,000	$20,000	30,000	30,000	30,000	40,000	40,000	120,000	350,000	437 50
Imperial	.....	.....	.....	.....	40,000	.....	24,000	24,000	24,000	.....	32,000	32,000	176,000	44 00
Yellow Jacket	.....	.....	.....	.....	.....	.....	60,000	60,000	60,000	60,000	60,000	90,000	390,000	325 00
Chollar-Potosi	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kentuck	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Crown Point	.....	.....	$30,000	48,000	48,000	48,000	.....	.....	.....	.....	30,000	30,000	234,000	97 50
Gold Hill Quartz M. & M. Company	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Empire Mill & M. Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	7,200	7,200	18,000	32,400	27 00
Gould & Curry	$60,000	.....	.....	96,000	.....	96,000	.....	.....	.....	.....	.....	.....	252,000	52 50
Total	$60,000	.....	$30,000	$164,000	$108,000	$164,000	$154,000	$154,000	$154,000	$167 200	$229,200	$370,000	$1,754,400	.....

The bullion product of some of the principal mines upon the Comstock lode at Virginia and Gold Hill, the dividends paid and the assessments levied for the years 1866 and 1867, are shown by the foregoing tables.[1]

These tables do not include all of the dividend-paying mines, for many of the valuable claims at Gold Hill are private property, and no reports of their production are made.

The Savage mine for the fiscal year ending July 10, 1866, produced ore to the following amounts and values, at a cost of extraction per ton of $18 06:

	Tons.	Pounds.
First-class ore	435	1,290
Second-class ore	26,338	1,650
Third-class ore	3,878	750
Total	30,652	1,690

The product of the ores reduced was:

	Value.		Per ton
First-class	$93,220 04		$224 08
Second-class	1,096,449 23		42 04
Third-class	62,084 54		20 43
Total	$1,251,753 81	Average.	$42 38

The following tables show the monthly shipments of bullion from the Comstock lode for 1865 and 1866 from the two express offices of Wells, Fargo & Co., at Virginia City and at Gold Hill:

Bullion shipped from Virginia City and Gold Hill, Nevada, for 1865 *and* 1866, *by Wells, Fargo & Co.*

Months.	1865.			1866.		
	Gold Hill.	Virginia City.	Total.	Gold Hill.	Virginia City.	Total.
uary	$253,602 89	$940,152 13	$1,193,755 02	$432,044 28	$520,177 20	$952,221 48
bruary	229,856 24	1,033,855 89	1,263,712 13	475,491 63	492,322 91	968,814 54
rch	235,485 68	1,154,749 76	1,390,335 44	490,123 89	705,210 33	1,195,334 22
ril	150,102 45	1,191,172 00	1,341,274 45	413,177 17	646,987 51	1,060,164 68
y	197,802 30	1,012,435 59	1,210,237 89	562,074 83	648,776 71	1,210,851 54
ne	246,725 62	694,256 11	940,981 73	673,111 40	562,938 70	1,236,050 10
ly	260,001 59	511,127 57	771,129 16	673,385 93	595,503 77	1,268,889 70
gust	314,808 93	550,730 78	865,539 71	672,690 14	779,276 59	1,451,966 73
ptember	399,613 99	492,203 79	891,817 78	700,940 33	643,963 97	1,344,904 30
tober	496,165 00	547,365 58	1,043,530 58	726,464 08	686,517 23	1,412,981 31
vember	408,307 90	539,217 76	947,525 66	613,779 62	739,512 30	1,353,291 92
cember	354,425 00	619,455 28	973,880 28	666,984 70	786,438 96	1,453,423 66
Total	$3,546,897 59	$9,286,822 24	$12,833,719 83	$7,100,268 00	$7,807,626 18	$14,907,894 18

It should be noted that these totals do not present the entire yield of e Comstock lode for the two years, for the bullion from some of the es is shipped from Carson City, and other points. The bullion from rson City, in 1866, amounted to $341,366 80.

[1] Carmany's Review, 1867.

Bullion product of the leading claims on the Comstock

DURING THE YEAR 1866.

Company.	January.	February.	March.	April.	May.	June.
Hale & Norcross	.....	$51,546 03	$64,059 33	$62,027 18	$55,942 46	$104,247 33
Savage	$140,000 00	150,000 00	110,000 00	66,553 70	115,000 00	130,000 00
Crown Point	52,327 14	155,461 63	148,552 35	115,102 11	110,514 82	109,601 05
Yellow Jacket	111,794 13	85,000 00	96,519 65	84,827 28	130,366 24	292,274 00
Gould & Curry	133,153 95	152,964 76	174,096 46	142,472 28	150,804 21	146,640 49
Chollar-Potosi	43,200 00	59,745 00	85,950 00	87,338 00	90,359 00	74,862 00
Empire M. & M. Company	38,191 82	36,000 00	27,697 00	29,542 49	34,363 04	34,482 75
Imperial	81,891 21	74,823 60	48,223 90	91,533 61	67,755 89	62,240 90
Confidence	19,474 12	10,141 19	12,474 01	17,624 09	15,869 42	20,869 47
Ophir, (aggregate)	51,523 04	27,478 51	49,604 45	84,340 81	81,593 57	25,665 89
Kentuck	.....	.....	.....	.....	.....	.....
Gold Hill Q. M. & M. Company	.....	.....	.....	.....	.....	.....
Overman, (aggregate)	.....	.....	.....	.....	.....	.....
Total	$671,555 41	$803,160 72	$817,177 15	$781,361 55	$852,568 65	$1,000,883 88

DURING THE YEAR 1867.

Hale & Norcross	$102,571 72	$117,639 44	$79,144 02	$76,462 58	$150,826 68	$117,728 23
Savage	250,000 00	270,000 00	150,000 00	337,000 00	408,000 00	370,493 96
Crown Point	140,000 00	129,850 00	64,541 58	63,971 00	82,000 00	77,550 00
Yellow Jacket[2]	156,200 37	117,488 97	108,913 85	222,075 44	278,684 63	195,913 65
Gould & Curry	66,423 00	45,165 41	52,878 47	63,130 19	74,862 68	44,446 46
Chollar-Potosi	80,000 00	100,000 00	86,000 00	245,094 00	334,289 17	345,000 00
Empire M. & M. Company	38,153 00	26,787 00	23,081 00	22,884 66	21,933 00	21,500 00
Imperial	115,948 67	116,200 00	90,431 96	95,162 91	94,000 00	107,000 00
Confidence	24,006 10	11,411 86	8,052 71	18,202 78	12,000 00	14,000 00
Ophir, (aggregate)	.....	.....	.....	.....	.....	.....
Kentuck	43,674 71	70,095 42	58,572 85	108,953 53	132,333 88	130,255 51
Gold Hill Q. M. & M. Company	5,400 00	9,600 00	7,300 00	10,000 00	10,866 62	12,500 00
Overman, (aggregate)	.....	.....	.....	.....	.....	.....
Total	$1,022,377 57	$1,014,238 10	$728,916 44	$1,262,937 09	$1,599,796 66	$1,436,387 81

[1] From Carmany's Annual Mining Review.

[2] The bullion product of the Yellow Jacket claim has been estimated for the last six months of 1867, as

during the year 1867, *as compared with* 1866.[1]

DURING THE YEAR 1866.

ly.	August.	September.	October.	November.	December.	Total.
073 00	$119,447 38	$153,666 63	$152,363 74	$167,034 89	$131,135 41	$1,186,543 38
000 00	162,478 00	145,000 00	210,000 00	231,000 00	214,847 39	1,814,879 09
557 00	80,451 10	116,573 76	111,150 17	91,326 00	184,854 00	1,312,471 13
706 00	379,699 92	292,566 78	180,288 67	202,090 27	160,000 00	2,297,132 94
000 00	134,395 23	117,821 35	114,321 67	124,683 61	108,427 00	1,624,781 01
641 00	65,682 00	50,367 00	58,962 00	60,645 00	100,000 00	848,751 00
440 76	31,520 25	41,813 15	42,000 00	45,000 00	33,240 12	422,291 38
408 16	75,840 52	78,459 87	99,476 87	83,687 17	81,045 67	910,387 37
196 74	29,696 58	37,059 56	41,563 72	27,975 69	25,987 12	304,931 71
582 60	27,684 56	20,683 22	22,586 24	6,729 19	.....	417,472 08
.....	.....	.....	.....	.....	.....	571,506 79
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	27,953 00
605 26	$1,106,895 54	$1,054,011 32	$1,032,713 08	$1,040,171 82	$1,039,536 71	$11,738,100 88

DURING THE YEAR 1867.

906 17	$124,664 69	$71,950 24	$49,980 22	$57,655 81	$14,767 65	$1,097,297 45
000 00	359,644 37	360,295 29	352,066 00	310,681 00	193,919 50	3,737,100 12
043 00	54,291 85	49,000 00	42,071 23	50,299 30	47,100 00	920,717 96
000 00	150,000 00	130,000 00	100,000 00	60,000 00	50,000 00	1,729,276 91
.....	30,043 11	75,842 74	65,474 86	90,235 69	6,117 90	614,620 51
681 17	350,000 00	252,000 00	253,866 89	164,976 67	145,977 46	2,668,885 36
312 32	22,333 80	18,689 40	20,571 43	18,757 48	17,604 08	278,607 17
627 54	89,280 00	97,980 00	68,897 94	63,395 48	68,571 00	1,106,495 50
527 52	12,304 17	11,310 11	13,547 71	686 50	.....	142,049 46
.....	.....	.....	.....	.....	.....	4,108 00
767 31	104,215 35	101,000 00	102,326 65	65,250 16	98,296 57	1,140,741 94
250 57	9,771 52	3,259 04	10,995 79	12,182 26	4,273 02	106,399 42
.....	.....	.....	.....	.....	.....	192,318 17
115 60	$1,306,548 86	$1,171,326 82	$1,079,798 72	$894,120 35	$646,627 78	$13,738,617 97

ures could not be obtained from the office of the company at Virginia.

TOTAL BULLION PRODUCT OF THE COMSTOCK LODE.

The statistics of the total yield of the Comstock lode, since work was commenced upon it, differ somewhat as presented by different persons. The Surveyor General of Nevada, in his report for the year 1865, estimates the total yield up to 1866 at $45,000,000. Commissioner Browne estimated it to be $66,000,000 up to January, 1867. This last sum is obtained by subtracting five or six per cent. from the total yield of the State, supposed to have been $70,725,000 up to the end of 1866.

In the year 1859 nothing was extracted but some rich ores from the surface, and a few thousand dollars' worth of gold washed from the outcrops and the ravine below them. Some of the ores were worked in arrastras at Gold Hill. The next year, 1860, three or four small mills were started, and the product was about $100,000, to which about $200,000 may be added for rich ores shipped to California, New York, and Europe.

It is believed that the following figures, derived from the sources cited and the writer's notes previous to 1865, fairly represent the production of the Comstock lode up to the 1st of January, 1868:

		Value.
1859, ore and bullion		$50,000
1860	"	300,000
1861	"	2,000,000
1862	"	6,000,000
1863	"	12,400,000
1864	"	16,000,000
1865	"	13,000,000
1866	"	15,250,000
1867	"	16,500,000
Total to January 1, 1868		$81,500,000

This bullion product consists of a mixture of gold and silver, and the ratio in value of the two metals is, gold 34.8, silver 65.3, as shown by the following table compiled from assays made at the Silver State Reduction Works by Louis Janin, jr., during 1863 and 1864.[1]

[1] From Report of State Mineralogist, p. 127.

showing the relative value of gold and silver in ores from the Comstock lode.

Name of mine.	No. of tons.		Percentage in value.	
			Gold.	Silver
	Tons.	*Lbs.*		
	267	200	42.49	57.51
	225	1,600	41.17	58.83
	398	300	50.68	49.32
	395	720	52.00	48.00
	1,147	200	51.25	48.75
	26	8	49.26	50.74
	175	790	22.85	77.15
	222	450	26.48	73.52
	307	800	24.00	76.00
	373	1,200	24 68	75.32
	168		33.94	66.06
	89		32.29	67.71
	133		25.84	74.16
	297	1,680	35.64	64.51
	225	620	37.94	62.06
	91	1,000	21.20	78.80
	82	1,000	34.16	65.84
	129	1,160	31.70	68.30
rry	440		24.63	75.37

ting this ratio the total bullion product of the Comstock lode divided as follows:

alue	$28,300,000
value	53,200,000
Total	$81,500,000

LANDER COUNTY.

county occupies the northeastern corner of the State, but the l mining districts are along the western and southern boundae following extract[1] gives the particulars of the discovery of this section of the State: "Early in the month of May, 1862, M. Talcott, an attaché of the stage station at Jacob's Springs, uling wood from the hill-side, now within the limits of the city n, discovered a vein of metal-bearing quartz, and carried a small with him to the station. The rock proved to contain silver; was located as a mining claim, and named the 'Pony,' as the r had formerly been a rider of the Pony Express. On the 10th May, 1862, a mining district was formed, including an area of 75 t and west, and 20 north and south, and named the Reese River District." From this point the discoveries extended north and ther districts were formed, and the Reese River district was y subdivided. The following table gives the names of the

[1] Harrington's Austin Directory.

majority of the districts in that section of the State, which, together with Nye county, is known as eastern Nevada. The discovery of silver was made upon the western slope of the Toiyabe range, which runs nearly north and south, and extends into Nye county.

List of districts in Lander county.

On western slope of the Toiyabe range:

1. Washington, 25 miles south of Austin.
2. Big Creek, 12 miles south of Austin.
3. Reese River, containing the towns of Austin and Clifton.
4. Amador, 6 miles north of Austin.
5. Mount Hope, 12 miles north of Austin.
6. Cumberland, 15 miles north of Austin.
7. Columbus, 20 miles north of Austin.
8. Mount Vernon, 30 miles north of Austin.

On eastern slope of the Toiyabe range:

9. Bunker Hill, 25 miles south of Austin.
10. Summit, 20 miles south of Austin.
11. Santa Fé, 20 miles south of Austin.
12. Smoky Valley, 12 miles south of Austin.
13. Simpson's Park, east of Austin.
14. Indian district, 15 miles north of Austin.
15. Callaghan ranch, 16 miles north of Austin.
16. Wall street, 25 miles north of Austin.
17. Cortez, 65 miles north of Austin.
18. Yreka, 75 miles north of Austin.

On the second range east of Toiyabe:

19. Eureka, 60 miles east of Austin.
20. Newark, 70 miles east of Austin.
21. Diamond, 80 miles east of Austin.
22. White Pine, 90 miles east of Austin.
23. Cascade, 90 miles east of Austin.

In the Ruby valley region:

24. Ruby, 125 miles east of Austin.
25. Wolf mountain, 120 miles east of Austin.

In the region of Egan cañon:

26. Gold cañon, 160 miles east of Austin.
27. Hercules, 150 miles east of Austin.
28. Antelope, 200 miles east of Austin.
29. Kinsley, 200 miles east of Austin.

It is well to observe that the veins in these districts, with the exception of Reese River district, are comparatively undeveloped. Some of the districts have been prospected and nearly abandoned, the veins not proving equal to the sanguine expectations of the locators, or not being rich enough to be profitably worked. The locations in some of these

are counted by hundreds and thousands, and generally but a rcentage of them afford encouraging prospects to the intelligent

aims in the vicinity of Austin, in the Reese River district, have gest known, are most explored, and are more generally produc- ı locations in some of the neighboring districts.

River district.—In this district there are more than 6,000 locations in claims of from 500 to 2,000 feet each. Only a few of these resent mined to any great extent.

ock formation is chiefly a compact granite. This is traversed by ıs and very rich veins of silver ore in quartz. These veins vary thickness of a card to one and two feet, and may be said to 12 to 15 inches. They are generally parallel, are often within a of each other, and dip at various angles. They are remarkable richness in silver and for the absence of gold. The following principal silver minerals which have been found to compose the the ore in most of the veins: dark and light red silver ore, erous gray copper, antimonial sulphuret of silver, polybasite, and pper portions of the veins, where the ore has decomposed, chlor- lver and native silver are abundant. It is probable that iodide mide of silver also occur in the surface ores.

llowing statement of the product of the veins in Lander county last three months of 1866[1] shows the remarkable richness of es, and the extent to which they were worked.

Product of mines in Lander county for last quarter of 1866.

Name of mine.	No. of tons.		Average per ton.
	Tons.	*Lbs.*	
.....	143	1,909	$91 18
.....	1	250	168 75
Star.....	4	920	336 57
.....	12	973	116 57
.....	4	438	405 10
.....	1		111 53
.....	4	779	187 65
e.....	7	619	99 22
.....	1	667	66 25
ler	4	416	177 28
.....	13	1,900	255 60
.....	7	1,359	54 00
.....	7	1,520	30 33
.....	3	1,453	71 12
rn.....	2	7	217 94
.....	22	1,695	220 42
y	1	100	251 18
.....	1	1,350	27 85
ey	1		116 80
.....	2	350	194 66
.....	1		197 27
.....	1	728	100 61

[1] the assessor's books; quoted in the Report of State Mineralo ist. pp. 99, 100.

Product of mines in Lander county for last quarter of 1866—Continued.

Name of mine.	No. of tons.		Average per ton.
	Tons.	*Lbs.*	
Lodi	7	1,019	$32 54
Livermore	3	500	157 79
Mount Tenabo (Cortez)			
Morgan & Muncey	4	626	25 69
Magnolia	6	1,671	338 23
Metacom	26		100 99
Manhattan Company	69	288	83 90
May & Davis	2	430	136 80
North river	13	1,924	56 03
Owen & Perkins	3	1,700	46 16
Providential	64	844	54 91
Pinney, Rev	6	600	51 73
Patten	2	824	200 43
Remington	6	1,500	49 63
Savage, consolidated	451		103 35
Silver Queen	14	1,913	38 28
Surprise	1		171 66
Semanthe	2	150	332 52
Timoke	79	1,138	148 41
Taylor & Passmore (Cortez)	5	982	160 43
Tunnehill (Eureka)	3	1,338	106 35
Victoria	4	1,176	91 20
Washington	12	67	479 52
Whitlatch Union	18	546	105 97
Zimmerman	5	1,278	71 75

According to the assessor's returns there are in Lander county, and mainly in Reese River district, fully 75 mines, which have produced bullion during the year, (1866.)

The ores of this district in the vicinity of Austin were freely represented at the Exposition by large masses of exceedingly rich ore, in which ruby silver was conspicuous.

Cortez district.—The principal veins of this district were discovered in 1863, and are remarkable for their enormous size. The largest is the "Nevada Giant," on Mount Tenabo, about 3,000 feet above its base. It can be followed for 18,600 feet, and some 20 locations, varying from 400 to 4,000 feet each, have been made upon it. The Gill, Taylor & Passmore, and St. Louis locations have been worked, and the "Cortez Giant," near the centre of the vein, has yielded a considerable amount of bullion. The following is a list of the claims: Commencing at its greatest altitude is the Chieftain: Genessee Company, 1,400 feet; Murphy Company, 800; Gill Company, 800; Taylor and Passmore, 800; De Witt Company, 450; St. Louis Company, 2,000; Meacham and Brothers, 400; Niagara Company, 400; Savage Company, 400; Nebraska Company, 1,200; Cortez Giant: Mount Tenabo Company, 4,000; Elmore Company, 200; Russell Company, 600; Continental Company, 1,000; Argentine Company, 1,000; Empire Company, 800; Coun and Brothers, 400; Travesse Company,

400; and the Anna Burr Company, 2,000 feet. The vein on the last-mentioned claim is somewhat broken, and at the end of the claim the vein disappears, and is lost altogether.

Washington district.—The principal ores in this district are argentiferous galena. The St. Helena mine has been opened to a considerable depth, but in general the district is at present deserted, owing to the difficulty and expense of working the ores. The veins are represented to be large and regular.

Eureka district.—Organized in 1864. The ores of this district are reported to be argentiferous galena, and to have yielded from 150 to 450 dollars a ton in Austin, where some small lots were taken to be worked.

Kinsley district.—"The Kinsley district is distinguished for its massive ledges of copper ore. It is in the Antelope range of mountains, near the eastern border of the State, 45 miles northeast of Egan, and 210 miles from Austin. The ledges of ore are of immense size, and many hundreds of tons of ore are represented as being upon the surface, which are proven by numerous assays to contain from 35 to 50 per centum of copper, and from $60 to upwards of $100 per ton in silver. The district is but little known; its great distance from the centres of population and a market rendering copper mines valueless for present purposes. The great Pacific railroad, now in course of rapid construction, is expected to pass through or near the district."[1]

Gold Cañon district.—"Gold Cañon district is one of the furthest east of Nevada, being 165 miles from Austin. It is better known as Egan Cañon. It was organized in 1863, and native gold showing plainly in the quartz of some of the veins first discovered, gave it the name of Gold Cañon. It lies upon the great trans-continental highway, where the overland mail stage passes daily. A small mill was erected in 1864, which met with great success. It is again in operation, and is reducing ore which returns nearly $200 per ton. A mill of greatly increased capacity is about to be constructed, which will add largely to the production of bullion."[2]

NYE COUNTY.

This county includes a large unexplored area, and has not yet been surveyed and mapped with any accuracy. Its unknown stretches of wilderness and desert have been penetrated by a few explorers, and our knowledge of it is being rapidly increased. The indefatigable prospectors for silver and gold have already located many very promising veins, and have organized districts, but chiefly in the upper half of the county, north of the parallel of 38°, and between longitude 114° and 117° 30′. This county, together with Lander county, form what is known as eastern Nevada, which was well represented at the Exposition by a splendid collection of rich silver ores from the principal veins.

[1] From "La Nevada Orientale," p. 100. [2] Ibid., p. 98.

Between 30 and 40 mining districts have already been laid out, and the following is as complete a list as can now be obtained:

A. In the Toiyabe range, south of Austin:

1. Blue springs.
2. North Twin river.
3. Twin river.
4. South Twin river.
5. Peavine.
6. Hot springs.
7. El Dorado.
8. San Antonio.
9. Marysville.

B. In the Smoky mountains, east of Toiyabe:

10. Northumberland.
11. Jefferson.
12. Philadelphia, or Silver Bend.
13. Manhattan.
14. Santa Clara.

C. In the Monitor range and Hot Creek range:

15. Danville, (Monitor range.)
16. Hot Creek.
17. Morey.
18. Empire.

D. In the eastern part of county:

19. Milk springs.
20. Reveille.
21. Pahranagat.
22. Worthington.

The following brief notices of the principal districts are taken chiefly from the descriptive publication upon eastern Nevada, circulated at the Exposition:[1]

Blue Springs district.—This is so named from a number of deep springs or ponds of water which lie in the valley at the foot of the mountains within this district. It contains a number of veins of quartz of large size, reputed to be rich in silver, but so slightly developed that their true value is not really known. Being in the mountain range, so singularly rich in silver and other metals, the district is, in all probability, as rich as those surrounding it. Near this, in the great Smoky Valley, is the extensive field of 2,000 acres of salt lands, from which is obtained the greater portion of the salt used at Austin and throughout the neighboring section, for both domestic purposes and the reduction of ores. Upon this salt-field, as on many others with which the State abounds, the salt rises as an efflorescence a half inch or more in thickness upon the surface of the ground, from whence it is carefully gathered. A slight rain

[1] La Nevada Orientale.

causes the salt to disappear, but under the influence of the sun it soon reappears. Many hundreds of tons are obtained from the field annually, and the supply coming from deep springs seems to be inexhaustible. It is furnished for the use of mills at from $30 to $50 per ton.

North Twin River district.—"Forty miles south of Austin we reach the North Twin River district. Although this section of the country was examined and many claims located early in the settlement of the country, it was not considered of importance until within a year or two of the present time, when quite thorough work upon a number of veins has proved them of large size and most extraordinary value. Deep cañons, with running streams, open to the plain, afford access to the mines and sites for reduction mills. The mines of the La Plata and Buckeye companies are in this district, and it is from the developments of these that the estimates of the value of the district are founded. A large mill is in course of construction by the La Plata company, which, in a few months, will be adding to the stream of bullion already commenced to flow from the mining districts bordering the Smoky Valley. Other mills are in contemplation, and will probably be in operation before the expiration of the present year."

Twin River district.—The Twin River district is 50 miles south of Austin, and is at present regarded as the most important of the districts on the eastern slope of the mountain. It received its name from two very pretty streams (although not in the district) which flow into the valley, running side by side, only a few yards distant, never uniting, but sinking soon after reaching the plain. The principal mines of the district are situated in Ophir cañon, where a large and busy village has been built. The Murphy mine is the one most explored, and by its great production of bullion has given a high reputation to the section of country in which it is located. A costly and complete mill, connected with the mine, with steam power operating 20 heavy stamps, and with furnaces for roasting and chloridizing the ores, was completed in the fall of 1866, and has since been in successful operation, producing $30,000 to $60,000 monthly. It is expected that another mill will be erected during the summer in connection with the McDonald mine, which is on the same vein as the Murphy. The Wisconsin and other cañons in the neighborhood are similar in formation and general character to the Ophir, and contain silver-bearing veins of great promise. The ore of the district is tetrahedrite, with gold and silver predominant, and containing some base metals. It is generally rich, and an abundance is obtained, producing upwards of $100 per ton. Water and wood are found in unlimited quantities in the mountains, and the soil of the contiguous valley is productive.

South Twin River, Hot Springs, El Dorado, and Peavine districts.—These districts succeed to near where the mountain range, which we have traced for 150 miles, falls away into the plain. They have been only slightly explored. The great Smoky Valley lies to the east of and between the range of districts which have been noticed, and the line of districts in the

Smoky mountain range. In the centre of the valley there are remarkable springs of hot water, throwing out a large and constant stream. "The basin of the spring is from 20 to 30 feet in diameter, and the fountain of boiling water rises in the centre, a constant column ascending by its subterranean force several feet above the surface. The water is excellent for all uses, and its great heat is found very convenient for domestic purposes."

San Antonio district.—San Antonio district, comprising the mountain of that name, is situated about 20 miles southeast of the southern terminus of the Toiyabe mountains, and about 90 miles from Austin. Several companies are at present engaged in successful mining, and large quantities of ore are extracted, which return, from reduction, an average of $200 per ton. The mountain is dry, barren, and broken, and for a depth of upwards of 200 feet, which has been reached, no water has been obtained. A few miles to the northwest are springs where two small quartz mills have been constructed. More vigorous work is now prosecuted upon the mines of this district than formerly.

Philadelphia or Silver Bend district.—On the eastern slope of the Smoky Valley range of mountains, and including a spur of them running to the southeast, about eighty miles south by east from Austin, is the district of Silver Bend or Philadelphia. Here have been found veins of great size, and exceedingly rich in silver. The chief discovery has been the single ledge called the Highbridge and the Transylvania. This, if a single ledge, has been traced and opened along a line for many thousand feet; it is described as always large, from five to seven feet in thickness, and as producing ore worth from $200 to several thousand dollars a ton. Specimens of the ore at the Exposition were assayed at the government bureau for the assay of minerals, under the direction of Professor Rivot, with the following results:

1. *Highbridge mine.*—Gray copper with sulphuret of copper and altered blue and green carbonate of copper, speckled with blende on ferruginous quartz. Assay in silver per ton of 2,000 pounds, $1,709 50.

2. *Transylvania mine.*—Sulphuret of copper, with blue and green carbonate of copper and mispickel on ferruginous quartz. Assay in silver per ton of 2,000 pounds, $2,794 68.

A portion of the vein became the property of David E. Buel, esq., who erected a small mill for the reduction of the ore, and in a few months produced bullion to the value of $100,000. The town of Belmont was soon built, and had a population of 1,000 miners.

The district of Northumberland is in the same range of mountains and 20 miles north of Belmont. Several tons of ore have been reduced to test the value of the veins and the product has been from $130 to $200 per ton, proving beyond dispute the value of the ore. The ledges are large and numerous.

Danville, Hercules, Hot Creek, and Milk Springs districts.—During the summer of 1866 thousands of square miles were explored and the districts of Danville, Hot Creek, Empire, Milk Springs and Reveille organized.

Hercules and Pahranagat had been previously formed. Hot Creek district receives its name from a singular stream of hot water flowing from several boiling springs, and forming a stream of several feet in breadth for two or three miles. It flows through a crack or chasm in the mountains, the walls of which rise 1,000 feet on either side. Limestone is the prevailing rock.

Empire and Milk Springs districts are in the Hot Creek range of mountains, and are respectively 20 and 40 miles south of Hot creek. They are but little developed.

Reveille district is 140 miles southeast of Austin, and in the range of mountains next east of Hot creek, from which district it is 35 miles southeast. Limestone is the prevailing rock, and it bears great masses of quartz rich in silver ores. They are located and regarded as veins, although quite irregular in appearance. The Antarctic is reported to be 56 feet thick; the August, 73 feet; the Crescent, 106; the Mediterranean, 60; the Atlantic, 40, and the National 45 feet thick. The following is the report of an assay made at the assay bureau of the French government upon a specimen from the collection sent to the Exposition:

Fisherman ledge.—Bullion Company, Reveille district. Quartz impregnated with altered copper, small specks of galena, and blende. Assay in silver per ton of 2,000 pounds, $1,713 46.

The district was organized in 1866, and had a mill of five stamps in successful operation.

Pahranagat district.—This district is located in the eastern part of the county, in a lofty range of mountains running nearly north and south. It is 50 miles east of Reveille district, and is about 150 miles north of Callville, upon the Colorado river. It was located in March, 1865, but, owing to distance from supplies and the presence of hostile Indians, a permanent settlement was not effected before October, and, during 1866, from 100 to 200 men were engaged there in prospecting and mining. The number of mining locations on record, in 1866, was about 1,000, and the claims extended over a belt of country five miles long by about three wide. The altitude is about 5,000 feet above the sea. The principal mines lie on the southern and eastern slopes of Mount Irish, which is composed of a whitish porphyritic rock, with dark colored limestone on the flanks, (abounding in crinoids and corals,) overlying slates, and capped with a heavy bed of quartzite.[1]

The veins are numerous and vary greatly in width, but in 1866 they had not been much worked or opened. Their general direction is northeast and southwest.

ESMERALDA COUNTY.

This county, occupying the southwestern corner of the State, and bordering upon California, is rich in gold and silver-bearing districts, of which the following is a list:

Aurora section—Esmeralda, Masonic, Van Horn, Montgomery, Pahdet,

[1] This notice is condensed from the report of R. H. Stretch, the State mineralogist. (1866.)

Thunder Spring. Blind Springs district and Bodie district adjoin the others, but are in California.

Walker Lake section—Lake district, Walker River, Cornell, Desert.

Eastern and southern section—Excelsior, Cottonwood, Minnesota, Palmetto, Red Mountain, Silver Peak.

Esmeralda district.—Located in 1860, and for a long time one of the most prominent mining districts of the State. The claims known as the Wide West, Real del Monte, Pond, Antelope, and others, were worked with considerable energy, and produced a large amount of bullion; but a few years ago the yield rapidly diminished, and owing to this and great excesses in speculations in mining property the district became unpopular and neglected. Costly mills erected in the vicinity are now mostly idle.

The veins are quartzose, and traverse a hard porphyry in irregular seams and bunches, forming a kind of stockwork. Large bunches or pockets of exceedingly rich ore were found in the Wide West and Real del Monte claims. The bullion contains a large percentage of gold. The bullion produced from the ores of Bodie district, in California, is in great part, at least, taken to Aurora for assay and is shipped from there.

Specimens of some of the ores of this district were exhibited in the collection from California.

Pahdet district.—This is a newly organized district, dating from the spring of 1866, and is southeast of Aurora, towards the White mountains. It is interesting as affording very rich specimens of copper glance in quartz, with free gold in large grains, and some combined silver. (Specimen No. 63 in the California collection.)

Walker River, Lake, Desert, and Wilson's districts.—These are located upon the western shore of Walker lake, and are about 15 miles east of Wellington's station, on the west Walker river. In Wilson's district there are veins of quartz containing free gold and no silver. Near Walker river rich copper-bearing veins are found which contain both gold and silver.

Red Mountain district.—This is in the extreme southern point of the county, near the line of Nye county and the California line. It is remarkable for an enormous quartz vein which bears free gold, and which outcrops upon the side of a mountain in such a position that it can be rapidly and cheaply mined, and it exposes a large amount of good ore. The veins are not yet developed.

Silver Peak district.—This lies immediately east of, and was formerly included in, Red Mountain district. There are numerous claims upon veins of silver ore of great richness, but none of them yet extensively developed or worked. These veins are interesting for their nearly horizontal position, and they appear to be contact deposits between a thickly bedded yellowish limestone, or dolomite, and granite. The Pocotillo series, the Vanderbilt, and the Sisson claims are prominent among those which have been partially opened.

The Vanderbilt claim was represented in the Exposition by specimens in the collection sent from eastern Nevada, and a portion was assayed at the government bureau of assays under the direction of Prof. Rivot, with the following results, according to the extract from the official register:

Vanderbilt mine.—Silver Peak and Red Mountain.—Quartz, impregnated with gray copper, with altered green and blue carbonate of copper, yellow hydrated oxide of iron, specks of galena, and perhaps sulphuret of silver.

Silver, per cent. 2.370; value per ton, $687 30; gold, per cent. 0.008.

The geology of this district is extremly interesting, as granite, trap dikes, yellow limestone and blue fossiliferous limestone, probably Silurian, and black slates are found in close proximity; while recent volcanic cones and deposits of salt, sulphur, and alum are found in the valleys.

CHURCHILL COUNTY.

The following mining districts have been organized in this county: Mountain Wells, Silver Hill, Clan Alpine, Desert, Augusta, Salina, Alamo, New Pass, and Ravenswood.

HUMBOLDT COUNTY.

A great number of mining districts were organized along both slopes of the Humboldt or Star Mountain range, in this county, and several thousand locations of claims were made and recorded, but only a few of these claims have produced any notable amount of ore or bullion. The principal districts are Prince Royal, Humboldt, El Dorado, Echo, Sacramento, Santa Clara, Star, Buena Vista, Indian, American, Sierra, Alabama, Pine-wood, Table Mountain, Cinnabar, Ohio, Columbia, Oro Fino, and Harmony. The Pueblo, Vicksburg, and Black Rock districts are in the northern part of the county, and their exploration and settlement has been retarded by Indian difficulties.

Sheba mine, Star district.—Perhaps the most prominent mine of the county is the Sheba, near Star City, in Star district, which a few years ago yielded a large quantity of very rich ore [illegible] of a refractory nature, being composed in great part of argentiferous gray copper, mixed with sulphuret of antimony. Failing in the reduction of this ore by the ordinary processes, the richest ore was sent to England to be smelted. The aggregate yield of the mine has been about $70,000. In the development and working of this claim 3,000 feet of tunnels and drifts have been run, at a cost of $75,000. The ore was found in irregular bunches or deposits, in metamorphic strata of the Secondary period, and does not appear to be in a regular vein. The principal bunches of ore have been removed, and the mine has since been unproductive.

De Soto claim, Star district.—Similar ore has been found in the De Soto

claim, in the vicinity. About 1,000 feet of tunnel has been run upon this claim, and about 200 tons of ore taken out, worth $100 per ton.

Gem of the Sierras mine, Sierra district.—This claim is located five miles east of Dunglen, in limestone. It affords very rich ore, some of it assaying $16,000 in silver per ton. An incline shaft has been sunk to a depth of 80 feet, and drifts have been run to an aggregate of 350 feet. In doing this work 178 tons of ore were taken out, which was worked by the ordinary pan process, and yielded $31,000, or at the rate of $175 per ton.[1]

Tallulah mine.—This claim is one and a half mile west of Dun Glen, and is in the outer hills of the first mountain range east of Star mountain. There are two or more lodes, well defined, trending north and south, and dipping to the west at about 45 degrees. These are cut by a tunnel 500 feet long. The ore is in some respects similar to that from the Sheba, and is characterized by a large amount of antimony. It also contains some native silver, and in general is very rich, some of it having yielded $1,000 per ton. About 50 tons of first-class ore had been taken out in 1865.

Montezuma mine, Trinity district.—The vein in this claim is interesting for the large amount of antimony and lead it contains. The ore is said to yield an average of $75 per ton in silver. By smelting, it yields $90 per ton, and 48 per cent. of lead and antimony.

TABULAR STATEMENT OF THE RESULTS OF THE ASSAYS OF ORES SENT TO THE PARIS EXPOSITION FROM EASTERN NEVADA.

The following statement of the results of the assays of ores from eastern Nevada was published and circulated at the Exposition in connection with the little work entitled *La Nevada Orientale.* It is given exactly as printed, with the exception of the correction of a few typographical errors. There appears to be a discrepancy, in some instances, between the percentage amounts and the value given in the translation:

Extrait des registres du bureau d'essai pour les substances minerales.

Paris, le 1er Août 1867.

ONZE MINERAIS D'ARGENT, PROVENANT D'AUSTIN-NEVADA, REMIS PAR M. GRUNER, INSPECTEUR GÉNÉRAL DES MINES.

1. *Highbridge Mine.*—Cuivre gris avec cuivre sulfuré et altérations de cuivre carboné vert et bleu, mouches de blende sur quartz ferrugineux.

Argent 0/0	4.535
Or 0/0	0.000

Extract from the register of the bureau of assay of minerals.

Paris, August 1, 1867.

ELEVEN SPECIMENS OF SILVER ORE COMING FROM AUSTIN, NEVADA, U. S., RECEIVED FROM Mr. GRUNER, INSPECTOR GENERAL OF THE MINES OF FRANCE.

1. *Highbridge Mine.*—Gray copper with sulphuret of copper and altered blue and green carbonate of copper, speckled with blende on ferruginous quartz.

Assay in silver per ton of 2,000 pounds	$1,709 50

[1] Report of Hiram Welch, county assessor, 1865.

ylvania Mine.—Cuivre sulfuré carbonaté vert et bleu; mouches et de galène cuivre gris et mis- quartz ferrugineux.

0/0 ..... 1.405
..... 0.000

rbilt Mine.—Silver Peak et Red Co, étiquette Pocotillo.—Quartz e cuivre gris avec altération de onaté vert et bleu. Fer oxydé ne, mouches de galène et peut- sulfuré.

0/0 ..... 2.370
..... 0.008

nanLedge.—Bullion Co., Reveille Quartz imprégné d'altérations faibles mouches de galene et de

0/0 ..... 4.545
..... 0.0005

Mine.—Yankee Blade.—Roche grise imprégnée d'argent sulfuré, tif, d'argent gris, de cuivre gris pyriteux.

0/0 ..... 6.250
..... 0.00025

-Eastern Mine.—Argent gris, ge, peut-être, argent sulfuré, teux en grains cristallins très- e de fer, mouches de galène sur

0/0 ..... 9.280
..... 0.00250

Mine.—Argent gris avec argent artz.

0/8 ..... 11.170
..... 0.0005

ke Mine.—Argent gris avec e et cuivre gris sur quartz.

0/0 ..... 14.100
..... 0.001

ttan Mine —North Star Mine.— re, argent gris avec mouches de sur quartz.

0/0 ..... 4.710
..... 0.0005

Mine.—Cuivre gris avec pyrite cuivre, mouches de galène sur un peu de feldspath rose.

0/0 ..... 6.930
..... 0.000

2. *Transylvania Mine.*—Sulphuret of copper, with blue and green carbonate of copper and mispickel on ferruginous quartz.

Assay in silver per ton of 2,000 pounds $2,794 68

3. *Vanderbilt Mine.*—Silver Peak and Red Mountain.—Quartz, impregnated with gray copper, with altered green and blue carbonate of copper, yellow hydrated oxyde of iron, specks of galena and perhaps sulphuret of silver.

Assay in silver per ton of 2,000 pounds $687 30

4. *Fisherman Ledge.*—Bullion Co., Reveille District.—Quartz impregnated with altered copper, small specks of galena and blende.

Assay in silver per ton of 2,000 pounds $1,713 46

5. *Chase Mine.*—Yankee Blade.—Gray quartz rock impregnated with sulphuret of silver, native silver, gray silver and gray copper, with copper pyrites.

Assay in silver per ton of 2,000 pounds $2,356 50

6. *Great Eastern Mine.*—Gray silver, ruby silver, perhaps sulphuret of silver, gray copper, copper pyrites in very small crystalline grains, iron pyrites, specks of galena on quartz.

Assay in silver per ton of 2,000 pounds $3,498 50

7. *Florida Mine.*—Gray silver, with ruby silver, and gray copper on quartz.

Assay in silver per ton of 2,000 pounds $4,211 09

8. *Timoke Mine.*—Gray silver, with ruby silver and gray copper on quartz.

Assay in silver per ton of 2,000 pounds $5,349 63

9. *Manhattan Mine.*—North Star Mine.—Ruby silver, gray silver, with specks of iron pyrites on quartz.

Assay in silver per ton of 2,000 pounds $1,365 90

10. *Diana Mine.*—Gray copper with iron and copper pyrites, specks of galena on quartz, with a little rose-colored feldspar.

Assay in silver per ton of 2,000 pounds $2,612 61

11. *Fairmount Mine.*—Twin river.—Galène à facettes curvilignes, cuivre gris, mispickel, mouches de blende sur quartz.

Argent 0/0 ..... 0.180
Or 0/0 ..... 0.00025

(Signed) L'Ingénieur en chef des Mines
Directeur du Bureau des essais.
L.-E. RIVOT.

11. *Fairmount Mine.*—Twin river.—*Galena* with curvilinear faces, gray coppper, mispickel, specks of blende on quartz.

Assay in silver per ton of 2,000 pounds $67 86

(Signed) Chief Engineer of Mines and
Director of Bureau of Assay.
L.-E. RIVOT.

REDUCTION WORKS IN NEVADA IN 1866.

According to the tabular statement presented on the following page, there were 85 quartz mills for the reduction or treatment of silver and gold ores in the State of Nevada in 1866. Most of these were propelled by steam. They had an aggregate of 1,260 stamps, and cost over $6,000,000.

Nearly all the machinery of these establishments, the stamps, rock-breakers, pans, concentrators, etc., was made in San Francisco and carted across Sierra Nevada in wagons.

Table of quartz mills in the State of Nevada in 1866.

[From Langley's Pacific Coast Business Directory.]

Location.	Name of mill.	When erected.	No. stamps.	Power.	Cost.[1]	Occupants or owner in 1866.
CHURCHILL COUNTY.						
Averhill	Connecticut	1865	15	Steam	$100,000	Conn. Mill and Land Co.
Clan Alpine	Clan Alpine	1865	10	do	100,000	Clan Alpine M. & M. Co.
La Plata	Silver Wave	1865	10	do	100,000	Silver Wave M. & M. Co.
	Desert		5	do	100,000	
ESMERALDA COUNTY.						
Aurora	Alturas		7	Steam		
Do	Antelope	1862	8	do	100,000	
Do	Aurora	1863	16	do	40,000	
Do	Gibbons		4	do		
Do	Independence	1863	16	do	60,000	J. D. Winters.
Do	Napa		8	do		
Do	Pioneer		8	do		
Do	Real del Monte	1863	30	do	150,000	
Do	Red Mountain		3	do		
Do	Union	1862	8	do	10,000	J. J. Poor.
Do	Wide West	1862	16	do	75,000	Wide West M. & M. Co.
Pine Creek	Pine Creek	1862	10	do	15,000	
Silver Peak	Martin & Co		16	do	40,000	S. B. Martin & Co.
Do	New York and Silver Peak.		10			New York and Silver Peak M. & M. Co.
HUMBOLDT COUNTY.[2]						
Dun Glen	Auld Lang Syne	1864	8	Steam	30,000	Auld Lang Syne M. Co.
Etna	Nason's	1865		do	35,000	A. W. Nason.
Do	Stevenson's	1865	10	do	60,000	Nevada S. M. Co.
Ginaca Bridge	Holt's	1866	4	do	20,000	G. W. Holt.
Oreana	Webber's	1865	10	do	35,000	Nevada S. M. Co.
Puebla	Puebla	1865	8	do	20,000	
Star City	Sheba	1863	10	do	60,000	G. Faulkner.
Do	Old Sheba	1863	10	Water	30,000	
Unionville	Pioneer	1862	8	do	30,000	Pioneer and Inskip M. and M. Co.
LANDER COUNTY.						
Austin	Boston and Nevada.	1865	10	Steam	80,000	
Do	California	1863	10	do	75,000	
Do	Long Island	1863	5	do	40,000	
Do	Manhattan	1864	20	do	100,000	
Do	Pioneer	1863	20	do	100,000	
Do	Silver Hill	1866	5	do	50,000	
Do	Union	1863	10	do	70,000	
Do	Ware	1865	5	do	40,000	
Big Creek	Eureka	1865	10	do	60,000	
Do	Parrott	1865	15	do	80,000	
Do	Phelps	1864	10	Water	30,000	
Butte cañon	San Francisco	1865	8	Steam	40,000	
Cortez	Cortez	1864	16	do	90,000	
Egan cañon	Hope	1865	5	do	30,000	
Do	Social Company	1865	5	do	35,000	
Do	Steptoe	1865	20	do	100,000	

[1] The estimate of the assessors for the machinery; value of mine not included.

[2] Webber's mill at Oreana has smelting furnaces, with capacity of 15 to 20 tons per day. The Humboldt River Mill and Mining Company are preparing [1866] to erect a fine 10-stamp mill near Dun Glen.

Table of quartz mills in the State of Nevada in 1866—Continued.

Location.	Name of mill.	When erected.	No. stamps.	Power.	Cost.	Occupants or owners in 1866.
Emigrant cañon	Keystone	1865	20	Steam	$95,000	
Kingston	New England and Nevada.	1866	20	do	100,000	
Do	Stirling	1865	20	Water	100,000	
New York cañon	Metacom	1866	20	Steam	50,000	
Telegraph cañon	Midas	1865	15	do	120,000	
Yankee Blade	Confidence	1865	10	do	100,000	
Do	Empire	1866	10	do	60,000	
LYON COUNTY.						
Carson river	Eureka	1861	20	Water	65,000	Dunbar, Hurd & Co.
Do	Franklin	1861	10	Steam and water.	35,000	Bank of California.
Do	Hydes			Water	5,000	W. B. Hyde.
Do	Island	1862	10	Steam and water.	35,000	C. A. Hill.
Do	Lindauer & Hirschman's.		15	Water	80,000	Lindauer & Hirschman.
Do	Ophir No. 1	1864	10	Steam and water.	20,000	Ophir M. & M. Co.
Do	Ophir No. 2		24	do	75,000	Do.
Do	San Francisco	1861	10	do	35,000	C. A. Shad & Co.
Como	Palmyra	1864	10	Steam	15,000	
Dayton	Birdsall & Carpent'r	1865	30	Water	45,000	Birdsall & Carpenter.
Do	Daney	1863	15	Steam	55,000	Daney G. & S. M. Co.
Do	Dayton No. 1	1861	16	Water	50,000	J. D. Winters & Co.
Do	Dayton No. 2	1864	20	Steam	40,000	Do.
Do	Dayton Reduction Works.		15	do	15,000	R. Helm & Co.
Do	Golden Eagle	1861	15	do	35,000	Rule & Co.
Do	Illinois	1864	15	do	35,000	Bank of California.
Do	Gould & Curry		80	do	950,000	Gould & Curry S. M. Co.
Do	Hoosier State		8	do	40,000	J. C. Clarke.
Do	Lands		20	do	60,000	Charles Land.
Do	Mariposa		13	do	20,000	Davis & McCurdy.
Do	Ogden		22	do	50,000	Ogden, Corey & Co.
Do	Rodgers		10	do	25,000	Rodgers S. M. Co.
Do	Summit		20	do	50,000	Summit Mill Co.
Do	Suncock		16	do	35,000	Bassett & Co.
Do	Winfield		18	do	80,000	L. A. Booth.
WASHOE COUNTY.						
Franktown	Dallas		60	Steam and water.	250,000	J. Dall & Co.
Ophir	Ophir		72	Steam	500,000	Ophir M. & M. Co.
Pleasant valley	Napa		20	Steam and water.	80,000	James Hill & Co.
Do	Temelic		15	do	75,000	W. C. Wallace.
Truckee Meadows	English county		20	Water	100,000	W. C. G. & S. M. Co.
Washoe	Atchison		20	Steam and water.	80,000	L. Tevis.
Do	Buckeye		10	Steam	50,000	L. Mason.
Do	Manhattan		24	Steam and water.	100,000	New York and Nevada G. and S. M. Co.
Do	Minnesota		16	do	75,000	Savage M. & M. Co.
Do	New York		24	Steam	111,000	N. Y. & W. M. & M. Co.

CALIFORNIA.

The discovery of silver ore in California dates from 1854, when a mass of elluret of silver, (Hessite,) a rare mineral, was found in the gold washings ear Georgetown in El Dorado county,[1] but all endeavors to find a vein deposit there have been unsuccessful. The portion of the State lying st of the crest of the Sierra Nevada, and bordering upon the State of evada, has several districts already noted for their rich veins of silver, t no very extensive developments of the veins have yet been made, d the production of silver bullion is not yet large. The eastern range crest of the Sierra Nevada, bordering the long valley occupied by ven's river and lake, is perhaps the principal silver region.

The following is a list of the districts that have been organized in that tion. Commencing at the north, and giving the names of the districts their order towards the south, we have, on the western slope of the hite mountain and Inyo range: Columbus, Slate mountain, Montmery, Lone Pine, Keyes, Inyo, Russ, Coso, Argus, Union, Telescope, d Soda Springs. (The four last named are beyond the limits of Owen's lley.)

On the opposite side of Owen's river valley, and on the eastern slope the Sierra Nevada range, commencing as before, on the north: Blind rings, Big Pine, Kearsarge, and Alabama.

Still further south is the Slate Range district, once quite noted as the ality of the Antrim lode and other veins containing much chloride of ver, but now, and for two or three years past, practically abandoned. rth of Blind Springs and Montgomery districts are Bodie Bluff, in no county, and Silver Mountain, Monitor, Mogul, Webster and Alpine tricts, in Alpine county. Recently, in the spring of 1867, some very h ore was discovered in a large vein called the Chicago in Shasta unty, west of the Sierra Nevada, and in the northern part of the State. e vein is reported to be quite large, and the ore abundant. It was presented by several specimens in the California collection, (Nos. 54 to .) This ore is a mixture of argentiferous gray copper and argentious galena, and is admirably adapted to smelting.

Other veins of silver ore have been found in the southern part of the ate in what is known as the Macedonian district in San Bernardino unty, represented in the Exhibition by a specimen presented by Mr. 'Heureuse from the Magenta lode. (No. 53 of the Catalogue.)

In the San Gabriel mountains, Los Angeles county, about 25 miles om Los Angeles, a vein of argentiferous gray copper has been opened Dr. Winston. This is a region, together with a broad area north of , as yet but very imperfectly explored, there being large tracts of county of which the topography is scarcely known.

Blind Springs district.—This district at the present time is one of the chest in silver of the State of California, and was represented in the

[1] *Vide* Report of a Geological Reconnaissance in California, p. 274.

Exposition by specimens from the following claims: Camanche, Josephine, Rockingham, and Diana. The Camanche specimen weighed about 100 pounds, and was contributed by Dr. Harkness and Dr. Frey, of Sacramento. The mass contained a large amount of silver in a state of admixture with antimonial ochre and green carbonate and silicate of copper. Chloride of silver, and perhaps bromide, was also present, and the whole mass had a dark greenish black color. The other ores were somewhat similar, but contained more of the chloride of silver, in visible crusts. These veins are not very wide, usually from six inches to two feet, and they traverse granite. The ore, however, is exceedingly rich, and yields up the silver readily by smelting.

Dr. Partz, who represents a New York mining company, has erected smelting furnaces, and produces a considerable amount of rich bullion, but no statistics have been received. A thriving village, called Partzwick, has grown up about these mines and smelting works.

Kearsarge district.—The veins for which this district was organized are situated in one of the highest peaks of the Sierra Nevada, known as Kearsarge mountain, a few miles west of the United States military station, Camp Independence. This mountain is composed of granite and slates, all metamorphosed, and is cut by veins up to the height of 10,000 feet or more.

The principal claims represented by specimens in the Exposition were the Kearsarge and the Silver Sprout. The latter crops out boldly at a great height upon the mountain, and contains some very rich ore charged with sulphuret of silver and native silver. It appears to be an ore that can be readily and cheaply worked. The Kearsarge claim is lower down the mountain and has also some very rich ores, but they appear to contain more galena and to be more difficult to work. Two or more mills are erected in the cañon below these claims.

Other veins of some promise, but not yet much opened, are the Mountain Sheep, Montezuma, and Pillar.

Inyo, Russ, and Coso districts.—These districts adjoin in the Inyo mountain range, the first east of the Sierra Nevada. The specimens in the Exposition, Nos. 69–73, were chiefly from the Eclipse claim. The ores are a mixture of silver, copper, and lead minerals. The Buena Vista lode, and the San Rafael, were represented by some very rich ores. Most of the veins of this district are characterized by containing large amounts of lead ore, either as galena or the secondary compounds resulting from its surface decomposition, such as the carbonate and the sulphate of lead. The attempts which have been made to work these ores in the ordinary way, by grinding in iron pans, were of course failures, and the mills which were built are idle or in ruins. Some attempts have since been made to smelt the ore, but the presence of roving hostile savages, and other difficulties, have hitherto prevented the development the undoubted riches of the region. A new district called Cerro Gordo reported, and the principal claims are the San Lucas, the Buena Vista, and the Bismarck.

IDAHO.

The great silver region of Idaho is in the southwestern corner of the Territory, in the Oro Fino mountain range, the divide between the Owyhee and Snake rivers, and about 450 miles southwest of Boise City. The rocks are granite and the veins numerous and parallel, trending nearly northeast and southwest. They have the appearance, in specimens, of being fissure veins, not generally of great width, but of extreme richness in silver and gold, giving bullion worth from $3 to $8 per ounce. The outcrops contain more gold than the rock below, which has not been decomposed by the action of the air and moisture, and which carries a large portion of silver. This is well shown by the following assays of two samples, one from near the surface in the lode known as the Oro Fino, yielded at the rate of $2,016 24 per ton in gold, and $425 03 in silver; total value $2,441 27. The other sample was from the Morning Star lode, near the water level, and gave at the rate of, per ton, gold, 310 19, and silver $2,216 39; total, $2,526 58. The only vein of this important region known by the writer to have been represented by specimens or statistics in the Exposition was the celebrated Poorman lode, of which the following is a short description:

Poorman lode.—This vein has become celebrated throughout the Pacific coast mining regions for the large quantities of extremely rich silver ore and native silver which it has yielded. Red or ruby silver ore occurs in large masses, together with chloride of silver in broad sheets and crusts, often beautifully crystallized. Native gold occurs also sparingly with the native silver in the partly decomposed ores.

Several blocks of the rich ore from 18 inches to two or three feet in length, and weighing several hundred weight, were exhibited at the Exposition in the central pyramidal mass of ores in the United States section. The remarkable interest and value of the exhibit was recognized by the award of a gold medal.

The Poorman claim is 1,600 feet in length upon the course of the lode. Of this the New York and Owyhee Gold and Silver Mining Company owns 1,142½ feet. Under this organization the mine was re-opened July 3, 1866, and work was continued upon it until October 23, being a period of three months. During this time about 15 tons of first-class selected ore were taken out, and this was packed in boxes and shipped to New York to be smelted at Newark. It was found by calculation that the expense of transportation would not be greater than the costs of treatment in Idaho, while the greater product by more careful reduction at Newark gave a larger profit. In addition to this production of rich ore, 2,382¾ tons of second and third-class ores were raised and worked at four mills, producing in refined bullion $546,691. The total cost of mining, hauling, milling, melting, assaying, and refining, with the revenue tax added, was $156,440, leaving the sum of $390,251 as the net proceeds, to which should be added the product of the 15 tons of rich

ore sent to Newark, a part of which was reserved for exhibition at Paris. The details regarding the production and costs, together with the average and net yield of the ores per ton, are shown in the following statement from the report of Mr. Wells D. Walbridge, made to the company in March, 1867:

Results of working Poorman mine from July 19 to November 1, 1866.

Name of mill.	Tons crushed.	Crude bullion.	Refined bullion.	Value of bullion.	Average of bullion per ton.	Remarks.
		Ounces.	*Ounces.*			
Jackson mill	369¼	7,860 20	7,323 29	$25,200 48	$68 25	Mostly third class gold rock.
Ainsworth mill	362½	34,592 53	33,178 52	62,220 81	171 88	87½ tons third class; 274¾ tons second class.
New York and Oro Fino mill.	771½	129,542 51	116,753 91	203,586 71	264 05	40 to 50 tons third class; balance second class.
New York and Owyhee mill.	880	156,394 25	147,960 17	255,683 59	301 91	All second-class rock.
Total value				$546,691 59		

Whole amount of rock produced and sent to mills.

New York and Oro Fino Gold and Silver Mining Company, accounted for	750¾
New York and Oro Fine Gold and Silver Mining Company, not accounted for	20½
Ainsworth Milling Company, as above	362½
Jackson Mill Company, as above	369¼
New York and Owyhee Gold and Silver Mining Company, as above	880
Total tons	2,382¾

Cost of hauling 1,133½ tons to Sinker creek, at $8	$9,068 00
Cost of hauling 1,249¼ tons to Jordan creek, at $6 50	8,120 12
Total cost of hauling	$17,188 12
Cost of milling 362½ tons at Ainsworth mill	$13,170 47
Cost of milling 750¾ tons at New York and Oro Fino mill.	30,030 00
Cost of milling 369¼ tons at Jackson mill	11,082 07
Cost of mining 880 tons at New York and Owyhee Gold and Silver Mining Company	35,200 00
Cost of milling 20½ tons at New York and Oro Fino Mining Company (balance)	820 0[illegible]
Total cost of milling	$90,302 [illegible]

Total expenses at mine for labor, supplies, lumber, timber, &c., less profit on money, $3,286 99	$38,707 74
Cost of refining and assaying bullion	7,250 01
Internal revenue tax, in gold	2,991 78
Net proceeds of 2,382¾ tons of rock crushed	$390,251 20
Value of bullion per ounce, refined, Jackson mill	$3 44 11/100
Value of bullion per ounce, refined, Ainsworth mill	1 87 53/100
Value of bullion per ounce, refined, New York and Oro Fino mill	1 74 38/100
Value of bullion per ounce, refined, New York and Owyhee mill	1 72 80/100
Average yield of all rock crushed, per ton	229 41
Net yield of all rock crushed, per ton	163 34
All charges for mining, milling, &c., per ton	66 07

The vein outcrops along the slope of a hill, and is reached by shafts and tunnels to the depth, in 1866, of 150 feet, and now, probably, (1867,) to a depth of 258 feet, by the completion of a lower tunnel 1,401 feet long. The best ore appears to be confined to one principal shoot or chimney between the north and south shafts, about 150 feet apart. No statistics for 1867 have been received.

STAMP MILLS IN IDAHO.

The number of stamp mills in operation in September, 1866, was 32, of which about three-fourths were propelled by steam. The aggregate number of stamps was 357, and the cost of erection was estimated at nearly $1,500,000.

The following is a list of the quartz mills in the Territory in 1866, with their location, name, and number of stamps:

Location.	Name of mill.	Number of stamps.
ALTURAS COUNTY.		
Bear creek	Idaho	12
Bear creek	Waddingham Gold and Silver Mining Co.	10
Clifton	Waddingham Gold and Silver Mining Co	40
Elk creek	Pittsburg and Idaho Gold and Silver Mining Co.	10
Red Warrior creek	Harris & Benson	10
Red Warrior creek	New York and Idaho Gold and Silver Mining Co	10
Red Warrior creek	Victor Gold and Silver Mining Co	20
Volcano	Defrees	10
Yuba district	Bledsoe	10
BOISE COUNTY.		
Centreville	Raymond's	10
Divide	Summit Flat	8
Elk creek	Elk Horn	5
Grime's creek	Bibbs, Jackson & Humason	8

List of quartz mills, &c.—Continued.

Location.	Name of mill.	Numb stam
BOISE COUNTY—Continued.		
Idaho City	Combs & Co	
Idaho City	Middleton	
Ice House gulch	Collins & Holliday	
Moore's creek	Cobden Mining Co	
Moore's creek	Gates	.....
.....	Van Wyck	
.....	Langdon's	.....
OWYHEE COUNTY.		
Golden creek	Lincoln	
Jordan creek	Cosmos	
Jordan creek	Martin & Co	
Jordan creek	Minear	
Jordan creek	Morning Star	
Jordan creek	New York and Oro Fino	
Jordan creek	New York and Owyhee	
Jordan creek	Shoenbar	
Jordan creek	Vass & Morse	
Sinker creek	Ainsworth	
Sinker creek	Grenzeback	
.....	Webfoot	

COLORADO.

There is evidence that Colorado will soon become celebrated for silver as well as gold regions. It is asserted that not only large vein argentiferous galena, but the true silver ores, such as the sulphur antimonial silver, and rich chloride, have been found in veins on the w side of the mountain range.

According to Mr. J. P. Whitney, the commissioner from the Territ to the Exposition,[1] "silver is found in all the gold mining district Colorado, associated with the ores containing gold; in the galena ticularly, which is found at times in considerable quantity. It is alw present, but not sufficiently plentiful to be a feature of value in the mines; yet large masses have lately been obtained by the smelting cess from ores considered strictly gold bearing, and it is quite evi that in the future, with the advantages of improved processes, this m will be freely obtained. But not until within the last two years wa generally known in Colorado that immense belts of silver veins, s rate from the gold, existed upon the western declivities of the Ro mountain range, corresponding in their direction and general featu with those of gold upon the eastern side. The prevailing great richn in silver in the ores of Griffith and Argentine districts, in Clear Cr

[1] Colorado and its Ores at the Paris Exposition.

county, upon the head-waters of South Clear creek, some 13 miles distant from the towns of Central and Black Hawk, and correspondingly near to the snowy peaks of the range, first attracted particular attention to the ores of silver. In these districts silver ores of great richness have been discovered, masses being exhibited at the Paris Exposition from the Baker lode of Argentine district, and of the Elijah Hise and Indigo lodes of Griffith district, which assay respectively in silver alone $532 12, $1,656 20, and $1,804 83 to the ton of 2,000 pounds of ore. These veins were followed to an altitude previously unknown in mining experience in Colorado. Enterprising men were soon engaged in prospecting the corresponding regions upon the other side of the range, which resulted in the discovery of immense deposits of rich argentiferous galena. The black sulphurets of silver, antimonial silver ore, rich chlorides, ruby silver ore, and pieces of native silver, were found, and a new region, the extent of which has not yet been determined, was thrown open to the attention of all those who might have the curiosity to examine it.

"That portion of the silver region first opened is situated in Summit county, upon the head-waters of the Snake and Swan rivers, which flow into the Blue river, a tributary of the Rio Colorado, which flows into the Gulf of California. An examination of the region a few miles southwest, in the neighborhood of Ten Mile creek, another tributary of the Blue, led to the discovery of still more wonderful exhibits of mineral wealth than were found in the Snake river region. Veins of great width and prominence were found, which, in some instances, could be distinguished by their discolored surface ores, when miles distant, seaming the mountain-sides like gigantic roads, measuring from 20 to 50 feet in width."

A later publication[1] by the same author states that "the commencement of the great belt of silver mines in Colorado is apparently in Griffith and Argentine districts in Clear Creek county. From those districts the lodes are distinctly traced southwest for more than a distance of 30 miles. In the districts of Griffith and Argentine, where the mines are situated at a height between 8,000 and 10,000 feet above the level of the sea, the silver veins, though plentiful and of great richness, have not the prominence and width found upon the belt in its continuation southwest. In Snake River district the veins are found equally, if not more plentiful, but having on the average more than double the width of those in the Argentine district. In Ten Mile district, particularly upon Fletcher mountain, the veins are characterized by a width and regularity not yet observed elsewhere upon the Silver belt. Such is the richness of some of the surface ores, that specimens can readily be found upon many of the veins which yield large globules of native silver when submitted to a strong heat. In the immediate vicinity of Fletcher moun-

[1] November, 1867; immediately after the return of Mr. Whitney from the Territory.

tain many silver nuggets have been found; also quantities of quartz, showing native silver, and all the evidences point most conclusively to the existence of large and rich deposits of silver ore, which can only be obtained by systematic development of their recesses.

"The known silver mines are now easily reached by a series of roads, which have been built during the past two years, and settlements are rapidly being made upon them. In the vicinity of the silver mines nearest to the gold mines, a town has been built (Georgetown) within a very short time, containing a population of 2,500 souls, where reducing works have been run during the past summer with great success. Unlike the first attempts made in Colorado to save gold, the silver works have been successful from the start. The works of Garrott, Martine & Co., at Georgetown, of very simple construction and small capacity, have given in the past few months over two tons of silver, and have been running upon ore that has yielded from $200 to $1,000 per ton coin value. The works at Georgetown are insufficient to work more than a small quantity of the ore offered, and extensive arrangements have been made by various parties to put up additional works the following year. The prediction is made by the writer, that however large the yield of gold from Colorado will be in a few years, it will be equalled if not surpassed by the yield of silver.

"The result attained by sending Colorado gold ore to the Swansea works in Wales has proved not only the great richness, but that the ore can be easily and economically worked. The 70 tons of ore sent, averaging by assay 8 per cent. of copper, 18 ounces of silver and 9 ounces of gold per ton, yielded a sum sufficient to pay the heavy expenses of teaming six hundred miles over the Plains to the Missouri river, freights from the river to seaport, and by vessel to Swansea, all expenses of working, commissions, &c., and a surplus exceeding $6,000, in currency.

"The perfected process of Swansea is now being introduced into Colorado, and this winter will demonstrate its success there."

Argentiferous galena is found in many of the gold veins, but is more abundant in "Ten-Mile district, Summit county, than in any other section yet known. In that district it is, in some instances, found projecting in large masses above the surface of the earth, upon the line of vein, and can be detached in a partially oxidized condition, in pieces weighing from 500 to 1,000 pounds. Upon Fletcher Mountain, thousands of tons could be easily gleaned from the surface; and but a short distance below the surface are large beds, the extent of which has not yet been ascertained. This galena is never found free from silver, yielding from 10 to 500 ounces to the ton of metal.

"From some pieces of galena, fair average ore from a number of veins in Ten-Mile district, the following assays for silver were obtained by Dr. A. A. Hayes, State assayer, of Massachusetts:

	Ounces.	Pennyweights.	Grains.	
ıid vein	81	13	8	per ton 2,000 pounds.
nac "	68	12	0	" "
ɔn "	266	8	0	" "
Dash "	108	2	12	" "
ɜtone "	85	18	6	" "
; "	65	6	16	" "
ɣ "	178	17	0	" "
ın "	106	9	20	" "
tine "	221	3	12	" "

an average exceeding 130 ounces to the ton."[1]

ARIZONA AND NEW MEXICO.

silver mining region of the Territory of Arizona joins upon the ın States of Sonora and Chihuahua, and is traversed by the same of mountains that bear so many rich silver veins in these States Durango and Zacatecas. The old town of Tubac was formerly the of the mining region of Arizona, and it is supposed that within nce of 15 miles from it each way there are probably 150 deserted ıines or openings. One of the best known localities is the Arivaca , and seven miles northeast is the Cerro Colorado, in which the elman mine is located. This mine was worked at intervals for ɾears under great disadvantages, and is said to have yielded)0 up to January, 1860. This, as well as the Santa Rita, the Pata- and other mines, were abandoned, in 1862, on account of the con- depredations of the Apache Indians, and work has not since been d.

ew Mexico there are important veins of argentiferous galena in ɡan mountains, about 15 miles from Camp Fillmore. Six different ıre described, all bearing argentiferous galena and copper ore. ɜrage silver yield of the decomposed veinstone is about $70. Other ɜ assay from $20 to $500 per ton.

similar to those of the Organ mountains occur in the San Dia .ins, near Albuquerque. There are silver-bearing veins, also, at ɾillos, 15 miles from Santa Fé. Silver veins and ores are reported San Juan mountains, and specimens of slag from ancient furnaces ɜèn found near Fort Defiance.[2]

NTIC PORTION OF THE UNITED STATES AND LAKE SUPERIOR.

lver veins, properly so called, are found east of the Rocky mount- in within the limits of the United States, but considerable quan- silver have been extracted from argentiferous lead ores at different ɜs, and have been found with the copper of Lake Superior.

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p. 50.

ırther details regarding these and other mines in New Mexico, see the volume on ɜs and Silver Mines, by the author; New Haven, 1861.

The most important mines of argentiferous lead ore are: the Silver Hill, or Washington mine, of North Carolina; the Wheatley mines of Phœnixville, Pennsylvania; the Middletown mine in Connecticut; the Northampton lead mines in Massachusetts, and the Lubec mines in Maine. Mines of argentiferous lead have also been worked in Wythe county, Virginia.

The Silver Hill mines in North Carolina were discovered about 1836, and were worked at intervals until 1852. The mine was then closed and was filled with water until about 1858, when it was reopened, but was again closed in 1861. Its production for 1844 is reported as $24,000 of silver, $7,253 of gold, and 160,000 pounds of lead. In 1851 it produced 56,896 pounds of lead and 7,942 ounces of auriferous silver, or an average of 11.2 ounces per ton of ore and 279 ounces per ton of lead. The ore is a mixture of argentiferous galena with zinc blende. Small quantities of silver glance have been observed by the writer, and an alloy of gold and silver of a pale yellow color like that of the Comstock lode.

The Wheatley mines of Pennsylvania are not now worked. The engine shaft is 300 feet deep, and the total length of drivage is over 400 feet. At the time of the suspension of operations there in 1854 the aggregate production had reached 1,800 tons. The galena ores yield from 70 to 80 per cent. of lead, and from 15 to 120 ounces of silver to the ton, or from 20 to 30 ounces on an average.

Lake Superior.—Large masses of native silver are found from time to time imbedded in the midst of the masses of native copper of Lake Superior, or are enclosed with it in the gangues. A variety of specimens was exhibited at the Exposition in connection with the display of Lake Superior copper. It is very singular that the two metals are perfectly joined so as to form homogeneous masses without any commingling or alloy. Specimens were shown that had been sawn into two parts, each of which was formed half of silver and half of copper.

It is impossible to ascertain the total production of silver from this source. Much of it was formerly stolen by the miners, and considerable amounts are reserved for specimens, or are worked up into table-ware without passing through any public channel. The following amounts from Lake Superior were deposited in the United States mint and branches for the years named:

1858	$15,623 00	1864	$8,765 7
1859	30,122 13	1865	13,671 5
1860	25,880 58	1866	22,913 9
1861	13,372 72	1867	18,555 3
1862	21,366 38		
1863	13,111 32	Total	$183,382 7

CHAPTER V.

THE SILVER REGIONS OF MEXICO, CENTRAL AMERICA, AND SOUTH AMERICA.

MEXICAN SILVER REGION—REAL DEL MONTE MINING COMPANY, AND GENERAL RESULTS OF ITS MINING OPERATIONS—DETAILS OF SILVER ORES REDUCED AND OF DIVIDENDS PAID—REPRESENTATION OF SILVER MINES OF CHILI AT PARIS—CHANARCILLO MINÉS—TRES PUNTAS—TOTAL SILVER PRODUCTION OF CHILI—PRODUCTION OF SILVER IN PERU AND BOLIVIA.

MEXICO.

It is to be regretted that the silver mines of this great silver-producing country were not represented in the Exhibition. In the year 1800 over 60 per cent. of the annual supply of silver to the world was drawn from Mexico, but the production has since greatly decreased.

Up to the time of the invasion of Mexico by Cortez, in 1519, silver does not appear to have been produced there in large quantities, though gold was very abundant. Thirty or forty years afterwards, silver mines were opened and worked at Tasco, Zultepeque, and Pachuca. In 1548 mines were worked in Zacatecas, and 10 years after in Guanaxuato. This was but the commencement of the great era of silver mining in Mexico, yet the annual yield at that time, according to an estimate by Humboldt, was not less than from $2,000,000 to $3,000,000.[1] It subsequently increased to $23,000,000 before the close of the 18th century. Between the years 1800 and 1810 the average coinage of gold and silver at the various mints in Mexico was $23,664,622; the ratio of the gold to the silver being, in value, as 0.05 to 1. During the war of independence the production was greatly lessened, and from 1810 to 1845 the average was not over $12,000,000 for silver and $100,000 for gold. Since that time the production has increased, and has been estimated by the best Mexican authorities at $23,000,000 in silver, and from $1,000,000 to $2,000,000 of gold annually. Mr. Phillips, in his recent work, says that the present annual produce of the mines cannot be much less than $26,000,000 in silver and $3,200,000 in gold. This estimate, however, appears to the writer to be much too high. It is well known that, during the civil commotion of the past four or five years, systematic mining has been neglected, and that the production in some sections has nearly ceased. In 1864 and 1865 many of the enterprising capitalists of California, stimulated by the great success of mining upon the Comstock lode, embarked in various silver mining enterprises in Chihuahua, Durango, and other States and districts accessible from the Pacific coast. Considerable quantities of silver and

[1] *Vide* Silver Ores and Silver Mines, &c., compiled by the author; New Haven, 1861.

silver ores were obtained; but in 1866–'67 most of these enterprises were abandoned. There are no very recent reliable statistics of the silver production in Mexico, but it is believed not to exceed $13,000,000 for 1867. The total produce of silver from the earliest period up to 1845 has been estimated by Chevalier at 162,858,700 pounds troy. Mr. Danson, in revising the statistics of the production of the precious metals in North and South America, gives the annexed tabular statements of the production from 1804 to 1846, inclusive.[1] This is made up from the mint returns, the reports of British consuls, and from Duport.

Production of gold and silver in Mexico from 1804 *to* 1846, *inclusive, (according to mint returns cited by Danson.)*

Period.	Silver.	Gold.	Yearly average.	
			Silver.	Gold.
In seven years, 1804 to 1810	$159,247,937	$9,181,767	$22,749,700	$1,311,[illegible]
In nineteen years, 1811 to 1829	191,331,930	9,187,044	10,070,100	483,[illegible]
In eleven years, 1830 to 1840	105,251,446	7,076,292	9,568,300	661,[illegible]
One year, 1841	12,781,747	756,058	.....	.....
In five years, 1842 to 1846	66,434,638	4,031,384	13,286,900	806,[illegible]
Total in forty-three years	535,047,698	30,232,545	.....	.....

To this total Mr. Danson adds an estimated production for 1847–'48 of silver, $26,573,800; gold, $30,232,545; and, adopting the estimates of Duport, that one-fifth of the total silver production, and five-eighths of the gold production, do not pass through the mints, he gives the following resumé of the total production of Mexico from 1804 to 1848, inclusive:

	Value of silver.	Value of gold.
Passing through the mints	$561,621,498	$31,845,[illegible]
Not passing the mints	140,405,374	53,075,[illegible]
	$702,026,872	$84,920,[illegible]

In the Statesman's Year Book for 1868, the present annual average production of the principal silver mining districts of Mexico is estimated as follows:

Zacatecas	$6,000,000
Guanajuato	2,000,000
San Luis Potosi	500,000
Guadalajara	600,000
Mexico	1,000,000
Durango	1,000,000
	$11,500,000
Bars and silver exported secretly, add	1,000,000
	$12,500,000

[1] *Vide* Journal Statistical Society of London, xiv.

The coinage of the mint has been as follows since 1856:

1857	$5,318,000	1863	$5,750,000
1858	5,215,000	1864	4,660,000
1859	5,485,000	1865	4,060,000
1860	5,785,000	1866	4,061,000
1861	5,384,000		
1862	4,660,000	Total	$50,378,000

Or an average of over $5,000,000 annually. The coinage for 1867 is estimated at about $4,000,000.[1]

REAL DEL MONTE MINING COMPANY.

The most recent statistics accessible upon the Mexican mines relate to the veins and works of the Real del Monte company, situated about 60 miles north of the city of Mexico. The total profits of these mines in the last 17 years has been over $12,000,000, and a large part of it has been divided between the shareholders and owners. These data were supplied to Mr. Phillips by Mr. Buchan, and, as they are of great practical interest, they are cited from the recent work of the former, page 284. There are now seven steam engines in operation for draining, with cylinders from 18 to 85 inches diameter. There are eight rotary engines for hoisting and driving machinery at the workshops, and 23 water-wheels at the different reduction works. The grinding or pulverizing machinery amounts to 350 stamp-heads and 74 arrastras, 24 driven by water-power and 50 by mules. There are 80 amalgamating barrels. The total number of cargas of ore reduced yearly is 312,000, of which 206,000 are treated by the barrel process and 106,000 by the patio process.

General results of mining operations by the Real del Monte company, in the districts of Real del Monte and Pachuca, in the year 1860.

General expenses of management	$50,170
Cost of draining the two districts	167,934
Cost of extracting ores from various mines	647,338
Cost of reducing ores in different haciendas	841,606
Duties on silver paid to the Mexican government	173,587
Freight of ores from mines to reduction works, including cost of repairing roads	186,503
Convoys of silver to the coast, or mint of Mexico	14,877
Agencies, commissions, &c	7,109
Total cost on current working of the mines	$2,089,124
Total produce, 277,396 cargas of ore, from which were extracted 423,394 marks of silver, value	3,710,891
Profit on current workings	$1,621,767

[1] Mexican Standard, November 11, 1867.

The above profit was applied as follows:

Reinvested in discovery works in different mines	$181,052
Reinvested in enlarging and improving works for the reduction of ores	73,120
Purchase of forests for fuel	31,000
Cost of maintaining a force of 150 cavalry and 50 infantry, necessary for the security of the districts during the civil war	60,000
Paid as dues to part owners of mines	353,070
Paid as dividends to shareholders of the company	923,525
Total	$1,621,767

Table of stores consumed during the year 1860.

Timber from forests belonging to the company	$30,000	
Wood fuel	200,000	
Charcoal	60,000	
		$290,000
Salt	150,000	
Quicksilver	100,000	
Iron and steel	50,000	
		300,000
Barley and straw	100,000	
Tallow and oil	40,000	
Gunpowder	15,000	
Sulphate of copper	14,000	
Sacks and cordage	18,000	
Lime and bricks	10,000	
Litharge	13,000	
Leather and hides	15,000	
Sundry stores	45,000	
		270,000
Total		$860,000

Table showing the details of silver ores reduced by the Real del Monte company, in the districts of Real del Monte and Pachuca, from May, 1849, when the present company was first formed, to the end of the year 1865.

Years.	Ores reduced by smelting.		Ores reduced by barrel amalgamation.		Ores reduced by patio amalgamation.		Total each year.			Average per monton.[1]
	Ores.	Silver.	Ores.	Silver.	Ores.	Silver.	Ores reduced.	Silver produced.	Value of silver.	
	Cargas.	*Marks.*	*Cargas.*	*Marks.*	*Cargas.*	*Marks.*	*Cargas.*	*Marks.*		
1852	7,108	45,671	281,629	221,827	21,975	19,412	310,712	286,910	$2,508,655	$9 00
1853	2,903	15,358	141,208	131,518	37,040	29,063	181,151	175,939	1,537,796	9 71
1854	2,386	14,913	152,614	160,900	37,982	31,313	192,982	207,126	1,811,822	10 73
1855	2,690	23,612	181,353	217,193	38,010	46,868	222,053	287,673	2,375,503	12 90
1856	6,011	48,666	209,053	243,041	46,490	58,843	261,554	350,550	3,081,663	13 40
1857	4,926	44,942	219,326	238 041	50,400	63,183	274,652	346,166	3,039,019	12 50
1858	5,056	49,582	217,461	218,291	48,355	53,638	270,872	321,511	2,824,831	11 80
1859	4,813	52,057	226,775	283,112	44,013	51,434	275,601	386,603	3,404,459	14 00
1860	4,698	47,442	222,498	314,745	50,200	61,207	277,396	423,394	3,710,891	15 20
1861	4,162	42,397	212,480	263,990	63,947	87,545	280.589	393,932	3,782,399	15 70
1862	4,203	47,518	209,861	310,906	60,412	73,968	274,476	432,392	3,445,222	14 00
1863	3,543	32,983	194,097	217,204	76,920	88,370	274,560	338,557	2,984,351	12 30
1864	3,500	29,067	205,850	229,946	105,740	142,697	315,090	401,710	3,432,107	12 40
1865	1,921	19,273	170,600	186,535	97,642	144,055	270,163	349,863	3,044,572	13 00
Total	57,920	513,481	2,844,805	3,237,249	779,126	951,596	3,681,851	4,702,326	40,983,290	12 77

[1] The *monton* varies in the different mining districts, but in Real del Monte and Pachuca is 10 cargas, or 3,000 lbs. The mark of silver is 8 Spanish ounces, of 443.8 grains each.

Produce and profit of the silver mines worked by the Real del Monte Company in the districts of Real del Monte and Pachuca, Mexico.

Four years to December—	Value of silver produced.	Profits paid—		Duties on silver to Mexican government.	Cost of draining mines.
		As dues to part owners.	In dividends to shareholders.		
1852	$2,508,655	$155,373	.....	$101,009	$215,541
1853	1,537,796	152,681	$256,250	66,015	69,344
1854	1,811,822	199,371	307,500	82,566	83,707
1855	2,375,503	194,511	461,250	108,604	86,815
1856	3,081,663	276,652	820,000	140,441	115,888
1857	3,039,019	241,553	461,250	138,375	107,286
1858	2,824,831	233,294	410,000	130,860	128,177
1859	3,404,459	364,858	666,250	158,939	120,777
1860	3,710,891	448,905	871,250	173,587	167,934
1861	3,782,399	433,963	820,000	175,359	156,687
1862	3,445,222	341,018	334,500	159,620	143,075
1863	2,984,351	178,936	557,500	138,466	174,135
1864	3,432,107	279,377	580,000	159,064	178,856
1865	2,044,572	136,815	.....	141,064	212,713
Total	$40,983,290	$3,637,307	$6,545,750	$1,874,442	$1,960,873

Total dividends to shareholders of Real del Monte Company	$6,545,750
Paid as dues to part owners of mines	3,637,307
Duties to Mexican government	1,874,442
Total profit of the Real del Monte and Pachuca mines—17 years	$12,057,499

NOTHERN MEXICO AND SONORA.

Valuable observations upon the silver mines of northern Mexico and Sonora will be found in an article by the late Mr. Rémond, a geologist and mineralogist, published in the proceedings of the Academy of Natural Sciences, of California, vol. iii, pp. 245–258. An important tabular statement of details concerning some of these mines, given by Mr. Rémond, is appended.

"The name of the 'Sierra Madre' is usually applied to the main range of mountains of this country, or the western border of the plateau which stretches north through the Territories of the United States, forming what may be called the great orographical feature of the continent. In northwestern Mexico this crumpled border of the great plateau comprises an extensive mountainous region, by no means forming a continuous single chain, but rather several central ranges, with associated groups of parallel ridges, all having the same general course, which is approximately north-northwest and south-southeast. As the breadth of the chain widens as we go towards the north, so, too, that of the valleys increases in that direction, the whole system of mountains and valleys spreading out in something like a fan-shape.

"Going north, the chain appears to sink gradually, although determinations of altitude in northern Mexico are extremely few in number. It is certain that there is, in about latitude 32°, a depression of the mountain ranges which extends entirely across the continent, and which would

enable the traveller to cross from the Atlantic to the Pacific, without necessarily surmounting any elevation greater than 4,000 feet.[1] The southeastern range is the highest, and the culminating point is said to be the Cerro de Cuiteco, 60 leagues northeast of Jesus Maria, on the western borders of Chihuahua. The approximate altitude of the Cumbre de Basascachic is 7,429 feet, and that of Guadalupe y Calvo 7,825 feet. To the north, the ranges east of Sahuaripa are also very high; but they have never been measured. No peaks or ridges, however, in this portion of Mexico attain anything like the elevation of the higher portion of the Sierra Nevada, few if any points exceeding 10,000 feet in altitude.

"The direction of the sierra is nearly that of a line connecting some of the best mining districts in Mexico, which are situated on or very near the summit of the mountains. These districts are the following, enumerating them in their geographical order from the south towards the north; in Durango, San Antonio de las Ventanas, Guarisamey, and San Dimas, remarkable for their auriferous silver ores, and 62 Mexican leagues northeast of Mazatlan; in Chihuahua, Guadalupe y Calvo, and San Pedro de Batopilas, yielding fine specimens of native silver; also, Jesus Maria, in the same state, and the Real del la Cieneguita, Sonora, with silver and gold mines.

"GENERAL GEOLOGY.—The geological structure of the occidental slope of the Sierra Madre, as well as that of other parts of this great chain, is exceedingly interesting, and, as yet but very little known, notwithstanding the valuable investigations of Humboldt and other eminent men; for, up to the present time, the age of the different formations has never been fixed with any degree of accuracy, from want of materials and of sufficient observations. In 1863, 1864, and 1865, however, I explored quite a number of localities in northwestern Mexico, and was thus enabled to obtain a pretty good general idea of the geology of that region; and, in Sonora, to which my attention was especially devoted, I succeeded in finding fossils in sufficient quantity to allow of the determination of the age of the principal formations of the northern Sierra Madre.

"The igneous rocks, which occur more abundantly on the Pacific slope, are granites, either fine or very coarse-grained; porphyries, more or less feldspathic; and greenstones, all of which are cut by numerous dikes of extremely varied character. The granites, however, are very poor in veins of the precious metals, while the porphyries are highly metalliferous. In Sinaloa (Candelero) and Durango (San Dimas) we see that the granites underlie the metalliferous porphyries, and that the greenstones, in Sonora, (near Hermosillo and in the vicinity of La Haciendita,) penetrate through them.

"The oldest sedimentary rocks which I have observed belong to the Carboniferous series; this is represented in the eastern part of Sonora by heavy masses of limestone, forming very high and rugged ridges, running a little west of north. The upturned strata are seen in many places to rest on granite. Argentiferous veins occur throughout this formation.

[1] See Emory, in Mexican Boundary Report, vol. i, p. 41.

"The next group of sedimentary rocks in order is the Triassic; this forms isolated mountain groups in Sonora, and offers an interesting field for investigation. Instead of limestones, it is made up of heavy beds of quartzites and conglomerates, with coal-bearing clay shales; all of these are disturbed and elevated, and rest on greenstones, feldspathic porphyries, or granite. Wherever metamorphosed, the Triassic rocks are auriferous and contain veins of silver ores. The metamorphic slates and limestones of the Altar and Magdalena districts, which include the richest gold placers of Sonora, may possibly be of Triassic age; but the fossils collected are too imperfect to admit of this being determined. There are some reasons for believing those rocks to be rather of Jurassic than of Triassic age, as they differ in lithological characters from both the Triassic and Carboniferous of northern Mexico, resembling rather the Jurassic gold-bearing slates of the Sierra Nevada, in California; besides, they lie outside and to the west of the Sierra Madre. It may also be noticed that the gold which they furnish does not resemble that obtained from the Triassic strata. The Cretaceous period is also represented at the foot of the Sierra Madre, at Arivechi, in Sonora.

"MINES.—The richest and widest veins are those northeast of Mazatlan, near San Dimas, Guarisamey, &c., in Durango. These veins cut all the rocks older than the Cretaceous, whether igneous or sedimentary. The mines of Sinaloa are richer than those of Sonora. In the former state the ore-bearing portion of the veins is from a few feet to several yards in width; in the latter, generally from one to two feet. In Durango and Sinaloa, gold, native silver, and sulphuret of silver occur, associated with galena, yellow blende, and iron pyrites. In Sonora the principal ores are argentiferous gray copper, with galena, black blende, copper pyrites, arsenical pyrites, carbonate of lead, ruby silver, arsenical silver, and gold. Each mining district is characterized by a peculiar system of veins; in all as many as twenty different systems have been observed. The most abundant vein stones are quartz, either chalcedonic, crystalline, or massive; brown spar; heavy spar; oxide of iron. The veins occurring in the metamorphic Triassic rocks are usually parallel with the stratification, so that they lie nearly horizontal where the formation has been but little disturbed. As to the yield of the silver ores, it varies extremely, and it would be necessary to enter into a full description of all the different districts to give an idea of it. It may be noticed, however, that the arsenical pyrites, which is auriferous in the Sierra Nevada, becomes argentiferous in the Sierra Madre. The veins vary in their direction from a little east to a little west of north; the richest ores near San Dimas run northeast and southwest. There are but few rich mines in Sonora, a state of which the mineral wealth has been much exaggerated. There are, however, some deposits of variegated copper, and veins of magnetic and specular iron.

"The annexed tabular statement will give the principal facts obtained with regard to the mines examined in northern Mexico:

Mines.	Location.	Country.	Strike.	Dip.	Width.	Matrix.	Ores.	Yield, per ton.
Naghuila	Near San Javier	Labrador porphyry	N. 35° W.	50° NE.	1½ foot	Crystalline quartz	Sulphates of zinc, lead, iron, arsenical, and copper pyrites; ruby silver and native silver.	1st class, $1,200; 2d class, $125.
Eureka	Between S. Miguelito and Los Bronces.	Greenstone	N. 45° W.	35° to 40° NE.		Quartz	Mispickel, blende, galena	
Pleiteada	Near San Javier	Labrador porphyry	N. 30° W.	45° NE.	1½ foot	do		
San Juan	do	Quartzite, (Triassic)	N. 65° E.	50° S.SE	4 feet	Quartz and iron ore	Galena, zinc, carbonate of lead, iron pyrites.	
Ceballos	Near Los Bronces	Labrador porphyry	N. 25° E.	85° S.SE	2 feet	Magnetic iron		
Higuera	do	Greeenstone	N. 5° E	80° East	2½ feet	do	Copper pyrites and gray copper ore.	
La Blanca	Near San Antonio de la Huerta.	Quartzite and conglom'e, (Triassic.)	N. and S.	15° East		Vesicular quartz	Gold and chloro-bromide of silver	$43
San Luis	do	Quartzite, (Triassic)	N. 40° W.	35° NE	1½ foot	Decomp. quartz and sulphate of baryta.	Blende, galena, mispickel, sulphuret of iron, and native silver.	1st class, $787; 2d class, $125.
Santa Barbara	Near Corral Viejo	Quartzite	NE. to SW.	30° SE	1½ foot	Quartz	Galena, carbonate of lead, iron pyrites, and gold.	$67 75
La Sierra	Near San Javier	Labrador porphyry	N. 60° E.	80° N.NW	3 feet	Magnetic iron	Gray copper and iron pyrites	
San José	Near Los Bronces	do	N. 27° E.		1½ foot	Sulphate of baryta	Magnetic iron and iron pyrites	
El Secorro	do	do	N. 25° E.					
Zaragoza	do	do	N. 23° E.			Magnetic iron		
San Luis Gonzaga	Near San Javier	do	N. 30° W.	30° to 40° NE.	8 inches	White quartz	Galena, blende, mispickel, and iron pyrites.	
La Colorado	Near Los Bronces	Altered sandstone and slate, (Triassic.)	N. 50° E.	80° South	5 feet	Iron ore and quartz		
Aguajito	Near San Javier	Labrador porphyry	N. 24° E.			Magnetic iron		
Santa Edubigen	La Barranca	Quartzite, (Triassic)	NE. to SW.	30° NW	2½ feet	Quartz		
La Cuadra	Near San Javier	Labrador porphyry	N. 10° W.	20° to 25° E.	1 foot	do	Arsenical pyrites, blende, and galena.	
El Rosario	do	do	N. 10° W.	20° to 25° E.		Crystalline quartz		
El Escritorio	do	do	NW. to SE.	NE	1½ foot	White quartz		
Santa Rosa	Between Los Bronces and San Javier.	Quartzite, (Triassic)	N. 10° E.	55° South	3 feet	Quartz and iron ore	Carbonate of lead, iron ore, galena, blende, and iron pyrites.	
Soledad	Candelero	Porphyry, (metam.)	N. 55° E.	85° SE	30 feet	Quartz		$266 65
Carmen	do	do	N. 85° E.	85° North	28 feet	do	Silver and gold, sulphuret of silver	186 65

Tabular statement showing the position and character of the principal mines of Northern Mexico, &c.—Continued.

Mines.	Location.	Country.	Strike.	Dip.	Width.	Matrix.	Ores.	Yield, per ton.
Atocha	Candelero	Porphyry, (metam.)	N. 45° E.	85° North	14 feet	Quartz	Silver and gold, sulphuret of silver.	$213 35
Rosario	do	do	N. 50° E.	70° to 80° NW	17 feet	do	do	160 00
Contrestaca	Near La Puerta	Metamorphic rocks	N. 63° E.	76° NW		White quartz	Blende, galena, sulphuret of silver	
Descubridora	do	do	N. 35° E.	69° NW		do	do	
Soledad	Between La Puerta and San Dimas.	do	N. 65° E.	Perp		do	do	
Candelaria	Near San Dimas	Porphyry, (metam)	N. 63° E.	63° N.NW		White quartz		1st class, $3,210; 2d class, $133.
Bolanos	do	do	N. 45° E.	75° SE	20 feet	do	Galena, blende, gold	
Cinco De Mayo	Near Zaragoza	Sienitic granite	N. 52° E.	75° NW	4 feet	do	Galena, blende, iron pyrites, brittle silver glance, native silver.	1st class, $800; 2d class, $180.
Cinco Señores	Near Copála	Greenstone	N. 20° W.	45° E.NE	1 to 4 feet	Quartz	Galena, blende, iron pyrites	
Napoleon	do	do	N. 10° W.	80° E	2 to 8 feet	Chalcedonic quartz	Galena, blende, copper pyrites, &c.	
Rosario	do	do	N. 50° W.	85° E		do		
Platino	do	do	N. 22° W.	Perp	4 feet	do	Galena, blende, copper pyrites	
Haval	A few leagues from Mazatlan.	Sienitic granite	N. 80° E.	80° N		Quartz	Oxide of lead, native silver	
Mina Grande	Near San Marcial	Metamorphic slates, (triassic.)	N. and S.	30° W	2 feet	do	Sulphuret of antimony, mispickel, copper pyrites, blende, iron pyrites.	
Las Cruzecitas	do	do	N. 15° E.	65° E.	4½ feet	Heavy spar	Tepustete with copper and iron pyrites, and gray copper ore.	1st class, $90 to $100; 2d class, $35 to $40.
Guijosita Vieja	Near San Javier	Labrador porphyry				Quartz	Galena, arsenical pyrites, blende, copper pyrites.	
La Antimonia	do	do				Crystalline quartz	Sulphuret of antimony and lead	
Dios Padre	Trinidad	do			9 to 12 feet of ore.		Gray copper ore, galena, iron pyrites, native silver.	
Agua Grande	Nine miles from San Marcial.	Porphyry, (volcanic)	N. 38° to 40° E.	80° NW	1½ foot	White quartz	Indigo copper, chrysocolla, chalkosine, chalcopyrite.	
La Colorado	Near Copála	Greenstone	N. and S.	20° W	40 feet	Chalcedonic quartz		
Algodona	Near San Marcial	Metamorphic slates, (triassic.)	do	30° W	8 inches	Rotten quartz and iron ore.	Chlorobromide of silver	

								$60.
La Prieta	....do....	....do....	N. 40° E...	80° NW		....do....	....do....	
Alta Gracia	Near San Antonio de la Huerta.	Quartzite, (triassic)	N. and S...	30° E	4 feet	Brown spar	Copper pyrites and gray copper	
Rosario de Guadalupe.	San Javier	Greenstone	N. 70° E...	60° S. SE	2 feet	Quartz	Black blende, iron pyrites, and galena.	
Aurora	Near Los Bronces	....do....	N. 10° E...	45° to 50° E	2 feet	Magnetic iron	Gray copper ore and copper pyrites.	
El Taste	Near San Javier	....do....	N. 15° E...	50° to 55° E	5 feet	Quartz	Galena, blende, copper and iron pyrites, (*petanque.*)	$100.
Providencia	Near Tecoripa	Quartzite, (triassic)	N. 10° E...	65° E	1 ft. 2 in	....do....		1st class, $200; 2d class, $35 to $40.
La Bojorqueña	....do....	....do....	N. 20° E...	65° E		Quartz, (ferruginous.)	Black blende, iron pyrites, galena, copper pyrites.	
La Chipioñena	Near Topisco	Granite						
Mina Prieta	Near San Antonio de la Huerta.	Quartzite, (triassic)				Brown spar	Copper pyrites, gray copper	
El Tesoro	Cacañhilas	Granite	NW. to SE.	75° SW	4 feet			1st class, $220; 2d class, $90.
Rosario	Cañada de la Iglesia, near San Antonio.	Quartzite, (triassic)	NE. to SW.	85° NW	2 feet		Galena and blende	$60 00
Babicanora		Limestone, (carboniferous.)	NE. to SW.	75° NW	5 feet	Quartz	Galena, iron pyrites, fahlerz, ruby silver ore; gold and silver.	$34 65

CHILI.

The silver regions of Chili were represented by a large and brilliant collection of the ores forwarded by the government commission at Santiago, and accompanied by a catalogue and explanatory notes upon the mineral wealth of Chili, by M. Domeyko, inspector general of the mines of Chili, and first professor in the School of Mines at Santiago. These notes were published in French, in connection with the statistical notices by the commission.[1] The following data are translated and condensed from those of M. Domeyko.

The principal branches of mining industry in Chili are: 1. The production of copper; 2. The production of silver; 3. The production of gold, cobalt, and nickel; 4. The production of coal.

The most important and profitable of all is the production of copper. This is exported chiefly in the ore, or reduced to a matt or regulus, much of which contains silver.

The value of the annual silver production of Chili is about $2,000,000. The most important and productive mines are in the department of Copiapo. In this department the silver-bearing formation, with the exception of some veins of argentiferous copper ore in the central Andes, is an argillaceous limestone of the Jurassic epoch, and the veins or deposits are usually found near the junction or contact of this formation with the eruptive rocks. The principal mines, and which have furnished nearly all the silver for exportation and for coinage at the Santiago mint, are those of Chanarcillo and Tres Puntas.

Chanarcillo.—The discovery and opening of these mines dates from 1831, and a description of them was given for the first time by M. Domeyko, in 1846. Since that time the field of mining has been considerably enlarged. Some of the principal mines are the Valenciana, Colorado,[2] and St. Francisco el Delivio. There are in all some 85 or 86 mines belonging to different proprietors, but very few of them are worked with profit. A railway now connects these mines with the port of Caldera, and thus, by affording cheap and rapid transportation, the proprietors are enabled to work ores which do not contain more than 1.001 to 0.0015 of silver.

These mines are remarkable for their production of the ore known as horn silver (chloro-bromide) in great quantities and in large masses. The principal varieties of ores now found are native silver, horn silver, and ruby silver. Some fragments of polybasite and of galena are found from time to time, but in general these and pyrites, blende, and sulphuret of copper are very rare.

A very good description of these mines is also given by Dorsey.[3] In

[1] Notice Statistisque sur le Chili et Catalogue des Mineraux Envoyés, á l'Exposition Universelle de 1867; 8vo.; Paris, 1867. Circulated at the Exposition.

[2] Annales des mines, 1846.

[3] Mining Magazine and Journal of Geology, &c., I, 102. See also "Silver Ores and Silver Mines," p. 59.

1859, 78 mines were worked, 1,200 men were employed, and the production was 8,000 pounds of pure silver monthly. From the date of their discovery in 1832 to 1859, the total production was valued at $60,000,000, nineteen-twentieths of which came from 25 mines.

The collection at the Exposition contained a variety of specimens from the Chanarcillo mines, Valenciana, Dolores, and Loreto. These were chiefly native silver and the chloro-bromide, with some specimens associated with native arsenic. Nos. 186 to 207 were interesting specimens of red silver ores, of different varieties and forms. No. 209 was a mass of pure chloro-bromide from a vein nearly an inch wide, without any gangue in the mine Descubridora. The whole series was accompanied by a suite of the rocks which are traversed by the silver-bearing veins. One specimen contained an *ammonite* taken from the Loreto mine.

Tres Puntas mines.—These mines were discovered later than those of Chanarcillo, and have been about 20 years under exploitation. They are situated northeast of Copiapo, further from the coast than those of Chanarcillo, but in the midst of a formation which appears to be of the same age and has a similar mineral composition. The district has also a much greater extent, and in the centre of it there is a mass of eruptive diorite which is not seen at Chanarcillo.

The chief difference between the mines of the two districts is that at Chanarcillo; the mines have produced and are still yielding large masses of chloro-bromide of silver and iodide of silver, which, in depth, pass into red silver and arsenical ores, while at Tres Puntas the mines have not yielded chloridized ores, except at the outcrops of the veins, but instead, they have given immense quantities of amorphous antimonial, and arsenical red silver ores, mixed with sulphuret of silver, with polybasite, arsenical cobalt, and, above all, native silver disseminated in the midst of the gangues.

The richest and most important of the Tres Puntas mines is called the Buena Esperanza, and it was represented by ten cases of specimens selected and arranged by Mr. Plisson, the engineer and director of the works. This collection contained, besides the product of the Buena Esperanza, some choice mineralogical rarities from other localities, such as large crystals, and groups of crystals, of light ruby silver from Chanarcillo, masses of native arsenic, native amalgam, miargyrite from the mine Alfinhallada; and a new species, a double iodide of silver and of mercury, called tocornalite.

The mines of the district of Aconcagua were also represented in the collection, as well as several other districts and mines of minor importance.

There was also an interesting metallurgical collection, showing silver ores and their products in the various stages of mechanical preparation and of treatment for the extraction of the silver and other metals. One series illustrated the process of amalgamation followed in the establishment of Messrs. Ossa & Escobar, directed by Kronnke. This process is said to have received the special protection of the Chilian government by a patent, and to remain a secret.

Another series contained specimens of the products of the smelting establishment of Nantoco, a few leagues distant from Copiapo. At this place silver ores, and copper ores containing silver, are concentrated into matts, which are then exported, chiefly to England, for further treatment and the separation of the metals. Following is a list of the specimens of the series, with their percentages of copper and of silver:

Percentage value of the matts in copper and silver.

Locality of ore.	Per cent. of copper.	Per cent. of silver.
Garin Viejo	0. 025	0. 0025
Cerro-Blanco Locabon	0. 300	0. 0018
Cerro-Tajo	26. 000	0. 0066
Nantuco-Brillador	0. 160	.....
Cerro-Blanco de la Sevenne	0 0250	0. 0040
Ponta de Cobre Bateas	0. 3000	.....
Checo de la Dolores	0. 5700	.....
Algarovito	0. 3400	0. 0008
Pintados de Farolo	0. 1500	.....
Bandurrias	0. 3000	0. 0014

It is customary to add to these ores the poor residues from the amalgamation works. The mixture gives matts, which contain 56 per cent. of copper, and 0.0241 of silver. The scorias usually retain 0.002 of copper, and 0.0005 of silver.

TOTAL SILVER PRODUCTION OF CHILI.

Humboldt estimated that the annual yield of silver in Chili at the beginning of this century was only 18,300 pounds troy. The total yield up to 1810 was estimated by Chevalier at 804,000 pounds troy; and from 1804 to 1845 at 1,803,636 pounds. The product in Copiapo from 1830 to 1853 amounted to 3,362,184 marks, or about $30,000,000.[1] The following tabular statements[2] of the metals and ores exported from Chili, and of the money coined from 1841 to 1858, with the exception of the years 1850 and 1853, for which there are no returns, show a total production of silver for 16 years of $46,826,998, or an average of nearly $3,000,000 per annum.

The statistics presented at the Exposition show that the exports of silver for five years (probably from 1860 to 1865) were 165,432 kilograms, about 5,321,396 ounces troy, or a mean of 33,086 kilograms a year, (1,064,266 ounces.) This does not show the total production of the country, for there should be added to these figures the value of the silver contained in the matts and in the rough ores exported, valued, in 1865, at $626,629; also the silver coinage at the Santiago mint, which, in 1865, amounted to $450,644, and in 1866 to $973,428, making the total value of the production for 1866 about $3,000,000.

[1] Mining Magazine, first series, iii, 38.

[2] Obtained from official sources in 1860, through Lieutenant J. M. Gillis, for the writer.

Metals exported from Chile and money coined at the mint in Santiago, Chile, from the year 1841 to 1849.

Year.	Gold at $2 50 per castellano, or 1-50th of a mark.				Silver at $10 per mark of 8 ounces Spanish.			
	Exported.		Coined.		Exported.		Coined.	
	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.
	Castellanos.		*Castellanos.*		*Marks.*		*Marks.*	
1841	48,110	$120,275	163,237	$408,093	140,123	$1,401,230	229	$2,290
1842	124,800	312,000	130,787	326,967	148,283	1,482,830	279	2,790
1843	16,510	41,275	154,325	385,813	115,688	1,156,880	5,783	57,830
1844	32,010	80,025	169,756	424,390	116,278	1,162,780	21,003	210,030
1845	88,150	220,375	132,987	332,467	175,052	1,750,520	15,432	154,320
1846	80,710	210,775	96,962	242,405	176,112	1,761,120	11,672	116,720
1847	112,205	280,512	114,550	286,375	176,285	1,762,850	5,844	58,440
1848	118,576	296,440	83,887	209,718	214,993	2,149,930	7,895	78,950
1849	105,228	263,070	312,188	780,470	309,373	3,093,730	13,635	136,350
Total	726,299	1,815,747	1,358,679	3,396,698	1,572,187	15,721,870	81,772	817,720

Year.	Copper per quintal of 100 pounds Spanish.						Total amount.			
	In bars, at $14 per quintal.		Ore, at $2 50 per quintal.		Regulus, at $4 50 p. quin.		Gold.	Silver.	Copper.	Total.
	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.				
	Quintals.		*Quintals.*		*Quintals.*					
1841	95,331	$1,334,634	258,219	$645,547	*	*	$528,368	$1,403,520	$1,980,181	$3,912,069
1842	76,437	1,070,118	367,964	919,910	*	*	638,967	1,485,620	1,990,028	4,114,615
1843	73,893	1,034,572	426,473	1,066,182	*	*	427,088	1,214,710	2,100,754	3,742,552
1844	88,225	1,235,150	328,376	820,941	110,541	$497,435	504,415	1,372,810	2,553,326	4,430,752
1845	100,944	1,413,216	284,562	711,405	92,784	417,528	552,842	1,904,840	2,542,149	4,999,831
1846	130,576	1,828,064	214,474	536,185	103,116	464,022	444,180	1,877,840	2,828,271	5,150,291
1847	140,893	1,972,502	94,577	236,441	86,202	387,909	566,887	1,821,290	2,596,853	4,985,030
1848	150,445	2,106,230	99,189	247,973	84,977	382,396	506,158	2,228,880	2,736,599	5,471,637
1849	178,716	2,502,024	76,884	192,210	59,368	267,156	1,043,540	3,230,080	2,961,390	7,235,010
Total	1,035,465	14,496,510	2,150,718	5,376,795	536,988	2,416,446	5,212,445	16,539,590	22,289,751	44,041,786

* The export of regulus for the years 1841, 1842, and 1843 is excluded on account of non-existence of the statistical reports for those years.

Metals exported from Chili during the years 1851, 1852, 1854, 1855, 1856, 1857, *and* 1858.[1]

Year.	Gold.		Silver.		Silver ore.		Copper.						Total.
							In bars.		Ore.		Regulus.		
	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.							
	Castellan.		*Marks.*		*Quintals.*		*Quintals.*		*Quintals.*		*Quintals.*		
1851	119, 901	$299, 753	248, 375	$8, 277, 319	41, 487	$269, 418	128, 729	$1, 749, 780	60, 336	$106, 195	65, 906	$216, 539	$10, 919, 004
1852[2]	.....	.....	372, 302	3, 511, 553	104, 516	497, 843	211, 515	2, 736, 951	257, 157	415, 429	145, 112	473, 490	7, 635, 266
1854	.....	.....	301, 577	2, 714, 193	159, 591	1, 434, 425	171, 989	2, 772, 364	445, 042	881, 983	144, 216	662, 269	8, 465, 234
1855	.....	.....	270, 984	2, 648, 746	265, 672	1, 697, 449	177, 765	2, 909, 916	563, 908	1, 330, 584	257, 852	1, 729, 793	10, 316, 488
1856	.....	.....	246, 620	2, 589, 563	151, 113	1, 390, 200	139, 543	3, 000, 173	630, 180	1, 840, 352	366, 076	3, 314, 179	12, 134, 467
1857	.....	.....	.....	1, 583, 234	.....	1, 524, 982	.....	3, 008, 610	.....	1, 953, 326	.....	4, 592, 134	12, 662, 286
1858	.....	.....	.....	1, 248, 666	.....	899, 817	.....	3, 922, 003	.....	2, 712, 971	.....	2, 759, 785	11, 543, 242
Total	.....	299, 753	.....	22, 573, 274	.....	7, 714, 134	.....	20, 099, 797	.....	9, 240, 840	.....	13, 748, 189	73, 675, 987

[1] No returns for 1850 and 1853, nor for 1859 and 1860.

[2] For the years 1852, 1854, 1855, 1856, 1857, and 1858 no standard price was given per castellano, mark, or quintal.

PERU.

The most celebrated mines in Peru are those of Cerro de Pasco, at an elevation of 13,673 feet above the sea. There are two very remarkable veins which intersect directly under the market place of the city. The first vein, Veta Colquirirca, trends north and south, has been traced 9,600 feet, and is 412 feet wide in some places. The second vein, Veta Pariarirca, has a southeasterly and northwesterly course, has been traced for 6,400 feet, and is 380 feet wide in some places. The production of silver from these veins has been enormous, but has fluctuated greatly. In 1784, 68,208 marks of silver were produced, and in 1785, 73,455 marks. From 1784 to 1820, 1826 and 1827, the amount of silver produced was 8,051,409 marks, or nearly 59,000,000 ounces. During 17 years the production was under 200,000 marks, and above 300,000 only during three years.[1]

Besides the Cerro de Pasco mines, which are not inferior to those of Potosi, there are other rich mining districts in Peru. Von Tschudi enumerates the provinces of Pataz, Huamanchuco, Caxamarca and Hualgayoc. The celebrated silver veins of San Fernando, which were discovered in 1771, are situated in Hualgayoc. Rich mines were formerly worked at Huantaxaya, near Iquique, but they were soon exhausted. The silver mines of Castro Virreyna, in the Cordillera south of Huancavelica, have been explored to a considerable extent. Of 30 mines only seven were worked in 1851. One steam engine was employed.

The following description of the Cerro Pasco mines is condensed from the report of Lieutenant Herndon.[2] After the discovery by the Indians in 1630, these mines were worked without drainage, and with but little success until 1780, when the *socabon* or drain, or adit of San Judas was commenced. This adit is 5½ feet wide and 6 feet 10 inches high, and delivers the water from the mines into the lake of San Judas. It is about 3,500 feet long; was finished in 1800, and cost $100,000.

In 1806 another adit was commenced 88 feet lower than the San Judas, and it was not completed at the time of Herndon's visit. It is 6 feet 10 inches wide, and 8 feet 3 inches high. A part is in solid masonry, well arched, and a large quantity of water flows through it. This *socabon* is known as the *Quiulacocha*. In 1816 a contract was made by the *gremio* for the drainage of the mines by steam machinery. Three steam engines and pumps were erected and worked successfully until the war of independence stopped operations.

In 1825 the drainage of these mines was undertaken by an English company called the "Pasco Peruvian." The compensation to this company was to be in ores from the mine. After driving 110 feet in the adit, at a cost of $40,000, (between September 1825 and January 1827,) this company failed, and the government of Peru undertook the work by paying $2,000 a month towards the expenses. The mines also contrib.

[1] Condensed from Travels of Von Tschudi.

[2] Herndon and Gibbons's Exploration of the Valley of the Amazon, Part I, p. 108.

uted 12½ cents upon each mark of silver. The work was placed under the charge of Rivero, and he extended the adit 122 feet. The miners furnished the powder and candles, and the superintendent supplied the tools. It was stated officially that it cost $86 dollars to excavate one vara. It was at that time 8,250 feet long, about 350 feet below the surface, and cost about $1,000,000. Steam pumping engines were again resorted to, and in 1851 two were in operation, a third was erecting, and a fourth had just arrived from England. The contract required the erection of four sets of engines, each to consist of two engines of 15 horse-power each, and to drive three pumps in such a manner that if any accident should happen to one engine the other would drive two of the pumps. These pumps were worked by chains and long copper rods. All the metal work was of copper. The acid water of the mine attacked and rusted iron very rapidly. It is said by Phillips that steam-power was first introduced into these mines in 1814 by Richard Trevithick, but the acid waters quickly destroyed the pumps, and in 1832 only one remained at work.

The ores are soft and were obtained in large quantities near the surface; the hill of Santa Catalina was completely honey-combed by the pits and galleries. These ores are known among the mines as *cascajos*; they do not require roasting, and they are worked in patio, or the "*circo*," requiring from 40 to 50 days. The general yield of these ores is six marks[1] to the *cajon* and their cost at the surface is from $6 to $16, according to their hardness and distance from the mouth of the mine. Following are statements of the expenses of raising and working.

Patio of 6 cajones at, $16 per caxon	$96 00
Transportation of 150 mule loads to the hacienda, at 25 cents	37 50
Grinding, at $10 per ca on	60 00
Magistral, calcined iron pyrites, 1 arroba	1 00
Salt, 40 arrobas, at 50 cents	20 00
Trampling by horses, at $5	25 00
Working and washing amalgam	11 50
Quicksilver lost, 35 pounds, at $1	35 00
Retorting the amalgam	6 00
	$292 00
Yield, 36 marks of silver, at $8 50	306 00
Profit	$14 00

This is a very small return, but it is observed that the ore rarely costs $16, and often gives seven or eight marks to the cajon instead of six, as calculated above.

The *pina*, or retorted amalgam, is put into bars of 125 pounds each at the government smelting house at the mines. All the produce of the mines must be melted there and stamped. The bars are marked with

[1] The mark = 0.507080 pound of 7,000 grains, and is worth about $8.60.

the number of the bar for the year, the number of marks it contains, the initials of the owner, and the figures 11.22, indicating the *ley* or quality. Remittances are made every week, and the expenses upon the silver before it is placed on board ship for exportation are thus enumerated:

Cost of a mark of *pina* in the mountains	$8 50
Impost for steam pumping engines	25
Public works	6¼
Government or export duty	50
Mineral tribunal duty	12½
Loss in running into bars	12½
Carriage to Lima, and other petty expenses	6¼
Profit to purchaser at the mines	37½
	$10 12½

Twelve pennyweights is the standard of pure silver in the mint at Lima. The bars are assayed, and if up to the standard are worth $8.6746 the mark; for every grain below 11.22 a deduction of .0303 of a dollar is made.

The remittances in silver bars, in April, 1851, varied from 4,500 to 7,500 marks weekly. The annual yield was about $2,000,000 in value. Lieutenant Herndon cites a calculation of M. Castelnau, by which it appears that the total yield of the mines since their discovery in 1630, to the year 1849, was about $475,000,000.

The total production of the Peruvian mines for 45 years, from 1804 to 1848, is estimated by Mr. Danson[1] as $216,485,527 in value. He adds 25 per cent. to the official returns to cover the production of various districts not enumerated. His estimates are as follow:

Apparently passed under official inspection	$146, 853, 494
Probably smuggled from the district of Pasco	19, 053, 005
Production of other districts whence no returns have been obtained	32, 918, 660
Probably raised in districts whence no accurate data can be obtained, add ¼ of $146,853,494	36, 715, 498
Total, silver	$216, 485, 527

For gold he estimates that the official records show only ⅜ of what is raised. The returns being $11,837,587 for 45 years, he adds $19,729,311, making an estimated total product of $31,566,898 in value. It is believed that these estimates are too high, too great an allowance being made for the amounts unofficially exported, and for obscure districts.

The present total annual production of the Peruvian mines is estimated by Phillips at 299,000 pounds troy, the value of which would be about $3,000,000.

[1] Journal of the Statistical Society of London, xiv, 32.

BOLIVIA.

The mines of Potosi were discovered in 1545, and have furnished an amount of silver which Humboldt estimated at £230,000,000, or about $1,150,000,000.

The average annual yield from the discovery to 1556 was about $11,600,000. At the end of the 17th century the production had declined to between three and four millions per annum. Chevalier, in 1845, estimated the annual production at from 48,000 to 60,000 pounds troy. In 1860 the annual yield was estimated at about $800,000. Chevalier estimates the total production of the Peruvian and Bolivian mines up to 1845 at 12,925,000,000 francs, or 155,839,180 pounds troy.

The total production of silver in Bolivia, from 1827–48, is estimated by Danson at $57,052,034, and of gold for 40 years from 1809–48, $16,115,522.

The Bolivian mint coined in 1849 $1,621,536 in silver, and $11,984 in gold. Much silver is smuggled out of the country to avoid the payment of government dues. The official record of production of gold and silver from 1800 to 1846, inclusive, is as follows:[1]

1800 to 1806	$21,186,460	1831	$9,784,620
1811	16,288,590	1836	9,848,342
1816	10,789,816	1841	9,678,420
1821	9,749,350	1846	9,789,640
1826	9,089,787		

In the Cerro de Potosi and vicinity, in 1851, 26 mines were being worked, and 18 were neglected. According to the government records there were in the mining districts of Porco, Chayanta, Chichas and La Paz 3,089 abandoned silver mines, and only 85 worked.[2]

[1] Report to United States government by Lieutenant Lardner Gibbon, 1853. [2] Ibid.

CHAPTER VI.

SILVER REGIONS OF EUROPE AND ASIA.

REPRESENTATION OF THE SILVER-LEAD MINES OF FRANCE AT THE EXHIBITION—SPAIN—ITALY AND SARDINIAN MINES—AUSTRIA—SAXONY—PRUSSIA—ARGENTIFEROUS LEAD ORES OF THE UNITED KINGDOM—PORTUGAL—RUSSIA—ORES OF SILVER AND LEAD AT THE EXHIBITION—KONGSBERG SILVER MINES OF NORWAY—TABLE OF PRODUCTION AND PROFITS—SPECIMENS EXHIBITED AT PARIS—SWEDEN—TURKEY—ALGERIA—CHINA—JAPANESE SILVER MINES AND EXPORTS.

FRANCE.

The silver produced in France is almost all derived from silver-lead ores obtained in great part from Sardinia, Algeria, Germany, and Spain. The production is divided between the following departments: Bouches-du-Rhone, Finistère, Isère, Lozère, Pas-de-Calais, Puy-de-Dome, and Seine-Inférieure.

The ores and products of the following companies and establishments were exhibited:

Upper Alps Silver Mining Company—Suquet Jun. & Company.—Argentiferous lead ores in various stages of preparation.

Pontgibaud Lead and Silver Mining and Smelting Company—Puy-de-Dome, 24 Rue Richer, Paris.—This company made an extensive and brilliant display of the lead ores and products of their works, arranged tastefully in a large glass case. The ore was shown in large masses, and in the various stages of mechanical preparation. The products were lead in ingots, large bars, rods, and sheets. The silver extracted from the lead was shown in a very large mass, nearly a yard in diameter, just as it came from the cupel, and it was valued at 135,000 francs, ($27,000.) The ores are from different localities, and have in general the following values in lead and silver:

	Lead.	Silver
Pzual, in 1,000 parts	620	2.450
La Grange, in 1,000 parts	287.50	1.087
Brousse, in 1,000 parts	730	3.600

The rich lead in bars contains .017 of silver, and the working lead 3.850.

Mines of Meyrneis, Loire—Eugene Joly, director.—Argentiferous lead and copper ores.

Villefort and Vialas Lead and Silver Mines Company—Lozere.—Paris, 33 Rue Bonaparte. Lead and silver ores, showing the mechanical preparation and the extraction of silver, together with a plan of the mines.

Lead and silver mines of Argentière—Bessee sur Durance, High Alps.—Granular galena in calcareous gangue. A large mass contains: lead, 43

per cent.; silver, 144 grams per 100 kilograms of ore, or 435 grams per 100 kilograms of lead. The following is the general average of the ores in silver and lead:

Ore of first quality: Lead, 45 per cent.; silver, 200 grams to 100 kilograms of ore, 444 grams to 100 kilograms of lead.

Ore of second quality: Lead, 40 per cent.; silver, 174 grams to 100 kilograms of ore, 434 grams to 100 kilograms of metal.

Ore of third quality: Lead, 38 per cent.; silver, 163 grams to 100 kilograms of ore, 430 grams to 100 kilograms of lead.

Urciers and Lignerolles argentiferous lead mines.—I. Javal, exhibitor. Argentiferous lead ores, with sulphuret, phosphate, and carbonate of lead.

Lead, Copper, and Silver Mining Company of the Ardillats—Rhone.—Ores and their products.

Ste-Foy silver mines.—Rhone.

Rigandeaux, Perdraux.—A. A. Clermont.

Terrand, Puy-de-Dome.—Argentiferous lead ores.

Gennamari and Ingurtosu—Sardinia, French Company.—The display made by this establishment includes specimens of massive galena with a fibrous structure and brilliant fracture. Some specimens are compact and granular. The ores yield as follows:

1. *Gennamari:*

Lead	76 to 81 kilograms in 100 kilograms.
Silver	60 to 66 grams in 100 kilograms.

2. *Ingurtosu:*

Lead	76 to 78 kilograms in 100 kilograms.
Silver	24 to 34 grams in 100 kilograms.

It was not possible to obtain recent statistics of the annual production of silver by these different establishments. According to Dalloz there were, in 1852, six argentiferous lead mines in the Puy-de-Dome, and four in Lozère. In 1858, eleven were under exploitation, and among them those of Poullaouen and Huelgoat, in Finistère; of Pontpéan, in Ille-et-Vilaine, and Vialas in Lozère, and Pontgibaud in Puy-de-Dome. The ores from the last mentioned locality, in 1847, yielded 344 kilograms of silver, worth 673,674 francs. In 1851 the production of silver amounted to 1,522,874 francs, about $300,000. According to M. Oeschger, quoted by Dalloz, from 5,000 to 6,000 tons of argentiferous lead ores are smelted and desilverized in France annually. The following table shows the weight and value of the silver extraction in France from 1853 to 1859, inclusive:[1]

[1] Compiled from Statistique de l'Industrie Minérale—Résumé des Travaux Statistiques de l'Administration des Mines. 1860.

Production of silver in France.

Year.	Weight, kilograms.	Value in francs.
1853	8,920	1,935,879
1854	16,258	3,544,817
1855	9,061	1,981,522
1856	26,477	7,012,876
1857	45,224	10,196,820
1858	47,508	11,716,036
1859	48,591	10,959,013
Total	202,039	47,346,963

SPAIN.

In the large and interesting exhibition of the various mineral productions of Spain, several of the most important silver mines and districts were represented.

The silver mines of this country were worked in the most remote periods, and by the Phœnicians, Romans, and Moors in turn. The mines of Guadalcanal and Cazalla are in mica slate, but are not now productive. The most important mines are those of Hiendelaencina, about 70 miles north of Madrid, in the province of Guadalajara. They were discovered in 1843. The vein traverses gneiss and coarse talcose slate, in an east and west direction, and with a southerly dip. The veinstone is sulphate of baryta with a little quartz, and some spathic iron. The most abundant ore is silver glance, and the average yield is about 90 ounces per ton. The mines have been worked to a depth of about 1,200 feet, and since 1858 the yield has declined. The production of these mines since 1846, up to July, 1866, a period of 19½ years, was 7,578,536 English ounces of fine silver, an average of about $450,000 a year.[1]

According to M. Petitgand[2] the value of the silver production in Spain from 1841 to 1848, eight years, was 50,329,895 francs. In 1854 it was 1,013,948 ounces, and in 1855 it was valued at 11,200,000 francs.[3] In 1858 the production amounted to 101,684 marks.[4] The official catalogue, issued by the royal commission of Spain at the Exposition, was accompanied by some statistics of the metal production of the country, from which the following figures are taken. In the year 1863 the production of lead ores, argentiferous lead ores, and of silver, was as follows:

	Metric quintals.	Écus.[5]
Lead ores	2.695.989	9.415.351,4
Argentiferous lead ores	403.395	
Silver ores	30.616	612.320,0

[1] Phillips's Mining and Metallurgy of Gold and Silver, pp. 263,264.

[2] Exploitation et du traitement des minerais de plomb dans le midi de l'Espagne, p. 27.

[3] Ostrechkoff; cited by Dalloz, p. 425. [4] M. Léon Vidal; l'Espagne en 1860.

[5] The value of the *écu* is not stated, and it is difficult to ascertain what value is intended It is probably 2,375 francs. The punctuation of the figures is given as in the original.

Value of the production of metallurgical establishments:

		Écus.
Lead	627,679 metric quintals, value	8,787,506.000
Silver	13,759,54 kilograms, value	1,128,282.280

Much of the silver is extracted from galena by Pattinson's process, or by cupellation. The true silver ores are amalgamated by the German method at a fine establishment in Guadalajara.

ITALY.

The silver ores in the Italian section of the Exposition were chiefly argentiferous galena, and from the island of Sardinia. A collection from this island, exhibited in the French section, has already been noticed.

In Tuscany the lead-bearing formation is a micaceous schist. The formations of Monteleone are calcareous, and carry sulphuret of lead mixed with fluor spar of various colors, and with quartz. In the Neapolitan provinces, at Longobucco, a similar association of the ore is united with blende, and contains 70 per cent. of lead and 0.0751 of silver. The ore is also found mixed with antimony and sulphate of barytes, and contains 30 per cent. of lead and 0.1515 of silver.

The most important deposits are in Sardinia, in crystalline argillaceous and micaceous or talcose schists of the Secondary and Tertiary periods. The most abundant deposits are in the province of Iglesias, where over 100 localities may be counted that are more or less remarkable, and are now or have been worked.

The various ores and products of these Sardinian mines were accompanied by a very interesting published description, by M. Léon Goüin, engineer of mines,[1] from which the following information is chiefly derived.

The best ores are those of Monteponi, which contain 80 to 81 per cent. of lead, and about 20 grams of silver per 100 kilograms. The gangue of these ores is limestone, somewhat ferruginous, and "very fusible." Around this mine are grouped the mines of San Giorgio, San Giovanni d'Iglesias, and San Giovanni de Gonnesa. All the deposits of the region are in limestone, ferruginous, magnesian, and sometimes silicious. The ores of Ingurtosu, of Gennamari, and of Crabulazzu are second in rank, and give from 76 to 80 per cent. of lead, and from 34 to 50 grams of silver. Their gangue is quartz, carbonate of iron, carbonate of lime, blende, and pyrites. The ores of Montevecchio are third in rank, and being somewhat refractory, are not so desirable. The gangue is rich in quartz, blende, and iron and copper pyrites.

The annual production of argentiferous lead ores in Sardinia is increasing, according to the official statistics given of the yield of 29

[1] Notice sur les Mines de l'Ile de Sardaigne; pour l'explication de la collection des minerais envoyes à l'Exposition Universelle de Paris pour 1867, par Léon Goüin, ingenieur civil des mines. Large 8vo. Cagliari, 1867.

different mines. The following are the totals from 1859 to 1865, inclusive:

	Metric quintals.		Metric quintals.
1859	78,642	1863	134,722
1860	133,538	1864	161,277
1861	141,240	1865	247,472
1862	147,560		

These ores ranged from 33 to 80 per cent. of lead, and from 10 grams of silver to, generally, 38 to 40 grams of silver per 100 kilograms.

Total annual production of silver.—The annual production of the lead mines and smelting works of Italy in 1862 was nearly as follows:[1]

Galena exported, containing an average of 70 per cent. of lead and 5 to 6 ounces of silver per ton	10,000 tons.
Lead	5,000 tons.
Silver, 3 tons, or nearly 96,000 ounces	3 tons.

At the present time, according to the statistics given at the Exposition,[2] the production is—

		Value in francs.
Lead, metric quintals	129,361	5,986,758
Silver, grams	6,625,919	1,409,235
Litharge, kilograms	29,885	13,448

Six hundred workmen are employed, and the annual expenditure for labor is 359,650 francs.

AUSTRIA.

The mines and mineral productions of this empire were illustrated by very complete collections of the ores and their products, and by models of the mines and furnaces, together with very elaborate geological maps and sections of mines. The chief localities of silver are in Bohemia and Hungary. In the former, at the mines of Prag, Elbogen, and Kommotau; in Hungary, at Neusohl Kaschau, Nagybanya, and Oravicza. The total production of silver ores, from both private and government works, in the year 1865, was 2,543,850 hundred-weight, (Vienna,) valued at 3,092,385 florins. The production of silver for the same period was 81,700 Vienna pounds, valued at 3,678,354 florins,[3] about $1,819,000.

According to M. de Carnall, and official statistics,[4] the production of silver from 1855 to 1859 was as follows:

	Kilograms.		Kilograms.
1855	35,016.318	1858	51,858.654
1856	59,615.450	1859	34,527.150
1857	53,394.750		

[1] Official Descriptive Catalogue. Kingdom of Italy. International Exhibition of 1862.

[2] Italie Economique in 1867.

[3] From statistical tables in Der Bergwerks, Betrieb in Kaiserthume Oesterreich, fur das Jahr, 1865. Wien, 1867.

[4] Cited by Dalloz, De la Propriete des Mines, ii, 297.

Phillips states that the mines of Hungary, Transylvania, and the Banat produce about 92,000 pounds, troy, of silver annually.

SAXONY.

The nature of the Saxon ores, and the processes for their reduction, were illustrated in the Exposition by very complete and interesting series of specimens. The Erzegebirge or "Ore Mountains range," on the western side of the Elbe, is divided into four mining districts, as follows: Altenberg, 31 mines; Freiberg, 98; Marienberg, 48; Schwarzenberg, 146. Of these mines only 20 are worked by the government; the others are explored by companies and private capital. In the year 1865 the amount of first-class ores delivered at the Freiberg smelting works was about 33,614 tons, worth about $1,017,305 in the raw state, or an average of $30 per ton. These ores, when worked, gave products to the value of about $2,000,000, of which nearly $1,403,862 in value was fine silver. The total yield of silver from the mines of Freiberg, from 1524 to the end of 1850, was 5,613,228 pounds troy.

PRUSSIA.

According to the catalogue accompanying the Prussian exhibit in Group V, Class 40, there are now in that country only two localities of any importance for their production of silver. These are Andreasberg, in the Hartz, and the vein Gondersbach, at Laasphe. A third locality of little importance is at Müsen and Littfeld. The ores of all three of these localities were exhibited.

The veins at Andreasberg and at Laasphe are in greywake of the Devonian period. The ores at Andreasberg are native silver, antimonial silver, and ruby silver. At Laasphe they are native silver, silver glance, and dark red silver ore. At Müsen, native silver, and argentiferous gray copper ore. No statistics of production were given.

The mines at Andreasberg were discovered in 1520, and the Samson vein has been worked to a depth of over 2,500 feet. The veins are considered to be exhausted at this great depth, and the present supply of ore is probably obtained much nearer the surface. The annual production from the mines of the Hartz, according to Phillips, is 27,540 pounds troy.

UNITED KINGDOM OF GREAT BRITAIN.

The argentiferous lead ores of Great Britain are the only source of its silver production, which averages about 600,000 ounces a year. The following tabular statement, received from the Mining Record Office, shows the production of lead and silver for the 10 years from 1856 to 1867.

Lead ore, lead, and silver produce of the United Kingdom of Great Britain for the ten years ending 1866.

Year.	Lead ore.	Lead.	Silver.
	Tons.	*Tons.*	*Ounces.*
1857	96,820	69,266	532,866
1858	95,855	68,303	569,345
1859	91,381	63,233	576,027
1860	89,081	63,525	549,720
1861	90,696	65,643	569,530
1862	95,311	69,013	686,123
1863	91,283	68,220	634,004
1864	94,433	67,081	641,088
1865	90,452	67,181	724,856
1866	91,047	67,390	636,188

This shows an average of over 600,000 ounces a year, or a value of about $750,000. The total value of the silver produced in the five years ending 1858 was £724,395, which is an average of about $725,000 per annum.

Most of this silver is extracted by Pattinson's process. The amount of silver per ton of lead varies from 10 ounces, and less, to 140 ounces. In general the ores from the north of England do not contain over 1½ ounces of silver per ton. The ores of the Isle of Man yield from 50 to 60 ounces of silver per ton of lead. Those of Cardiganshire and Montgomeryshire contain from 15 to 25 ounces. The Cornish ores contain on an average about 30 ounces of silver per ton.[1]

PORTUGAL.

The Lusitanian Mining Company and the company of the mine of Telhadella exhibited specimens of galena and silver lead ores, and A. A. Pinto, of Oporto, contributed specimens of native silver and silver lead ores from the mine of Varzea de Trovons. The production of silver is comparatively insignificant, but no statistics were obtained.

SWITZERLAND.

Baglioni & Co. exhibited specimens of argentiferous copper ores from Xamins, Grisons; and the company of the mines of the valley of Schams, Andeer, Grisons, displayed specimens of argentiferous lead.

RUSSIA.

The mineral collections sent to the Exposition from Russia contained numerous specimens and illustrative series of specimens from several of the mines and establishments for the production and working of argentiferous galena and other ores of silver.

The chief localities of silver, lead, and copper are in the Great and Little Altai mountains, in the Ssalaire chain, and in the group of Karkaralinsk

[1] Phillips's Mining and Metallurgy of Gold and Silver, p. 252.

and the chain of mountains beyond Lake Baikal. Silver ores are also found in the district of Aertschinsk, and in the Caucasus, (mines of Alaghir.) All the mines of silver and lead are the property of the Emperor, with the exception of those of Alaghir, which belong to the state. Recently mines of silver-lead have been opened in the Kirghese steppes, at Karkaralinsk.[1]

The exploitation of silver in Russia dates from the reign of Peter the Great. The first vein or deposit was discovered in 1691, in the district of Nertschinsk, upon the river Arghoumi, near the ancient "puits Finnois."[2]

The principal mines of the Altai region were discovered in 1739 by T. C. Demidoff. The ores of silver and gold are smelted in five establishments, at Barnaoul, Pavlovsk, Garrilovsk, Tmeivsk, and Loktevsk. These extract about 1,050 poods of silver, of 90 per cent., containing about 55 poods of gold.[3]

In regard to the total production of silver in this country, Messrs. Tchevkine and Ozersky have estimated that up to 1851 it amounted to 108,719 poods, more than 1,800,000 kilograms, which is in close accordance with the figures given by M. Tarresenko-Otreschkoff, who estimates the amount for the same period at 1,884,083 kilograms.[4] From 1851 to 1855 the last-mentioned authority estimates the production at 68,426 kilograms, valued at 15,215,200 francs. This is about 17,000 kilograms a year, which is nearly the same as the present production, according to the statistics published at the Exposition and presented in the following table from official sources:[5]

Production of the silver and lead mines of Russia for 1863.

Districts.	Silver.		Lead.	
	Poods. *l.*	*Kilograms.*	*Poods.*	*Quintals.*
Nertschinsk	1,044 29	171,233	64,902	10,817
Altai	7 21	1,234	631	105
Mine d'Alaghir	25 20	4,180	5,210	868
Kirghese steppes	35	135	977	162
Total	1,078 25	176,782	71,720	11,952

The silver production is valued at 852,410 roubles, (3,409,640 francs, or about $681,928.) Total value of the lead, about 580,000 francs, or $116,000.

According to Phillips, the most important silver mine of the Altai is Zméof, which is opened on a great vein, bearing argentiferous native gold, native silver, and sulphide of silver, together with ores of copper. The principal vein is worked to a depth of 95 fathoms.

[1] Apercu Statistique de la Russie.
[2] Dalloz, de la Propriete des Mines, ii, 338.
[3] Catalogue Special de la Section Russe, Expos. Univ., 1867.
[4] Vide Dalloz, de la Propriete des Mines, &c., ii, p. 340.
[5] Apercu Statistique des Forces Productive de la Russie, p. 144.

The Exhibition contained specimens from the mines of the Altai, sent by the administration of mines for the government of Tomsk, and included specimens from Biysk, Kouznetsk, and Barnaoul.

Argentiferous lead mine of Yiransk.—The ores occur in argillaceous talcose and chloritic slate. The oxidized ores contain 3½ to 7 zolontiks of silver to the pood[1]=15 grams to 29 grams in 16.3 kilograms. The ores from greater depths are argentiferous sulphuret of copper and argentiferous blende.

Silver mine of Sokol.—In argillaceous and silicious schist. The oxidized ores contain 1¾ to 2½ zolontiks of silver per pood.

Mines of Salairsk.—Vein of Soimonovsk. The oxidized ores contain ⅝ to 1 zolontik per pood.

Lead works of Barnaoul.—This display contained: 1. The secondary and intermediate products of the smelting, such as scoriæ, matts, litharge, &c. 2. The materials used for the construction of the furnaces and during the smelting, such as Glauber's salt, limestone, fire-bricks, fire-clays, stone used for the tymp and the crucible of the furnace. 3. The lead containing silver, (12 zolontiks per pood,) and the lead after the first, second, and third stages of desilverization. 4. The fine silver.

Kirghese Steppes, Siberia.—Ores of copper, lead, argentiferous lead, iron, and coal, exhibited by Nicholas and Alexander Popoff, (No. 499 Catalogue Special.) A large specimen of native copper in this display was found to contain a small mass of native silver, attached to the copper as perfectly as in the specimens of native silver and copper of Lake Superior. The lead ores of Bogoslovsk contain 42 per cent. of lead and three zolontiks of silver per pood.

There are five mines of argentiferous lead in this region, which give ores containing from 1½ to 20 zolontiks of silver to the pood, and from 40 to 60 per cent. of lead.

Medvége island.—Ores of silver with the gangue, exhibited by Michael Sidoroff.

NORWAY.

The celebrated silver mines of Kongsberg were represented in the Exposition by a very complete and interesting series of the ores and the enclosing rocks, together with several maps and vertical and cross sections of the veins and workings of the mine. The specimens of crystallization of silver and its ores were remarkable for their size and perfection.

The following statistical data are derived from information furnished to the writer by Mr. Stahlsberg, the chief engineer of the mines, (September, 1867:)

These mines were discovered in 1624, and have been worked by the government since 1814. The number of veins in the district is very great, but only a few of them are worked. They traverse crystalline

[1] 1 pood=16.380 kilograms; 1 zolontik=4.266 grams.

micaceous and hornblendic schists, trend nearly northwest and southeast, and are nearly vertical. In width they vary from a few millimetres to one or two feet, but are generally from four to eight inches thick. They can be followed horizontally for a distance of 600 feet or more, but the ores are found within but a small portion of this distance, being usually confined to a few fathoms upon the course of the vein. The greater part of the silver is in the metallic state, partly disseminated in the gangue, but often in nests or bunches of large size, and in crystals, as shown at the Exposition. The gangue is chiefly calcareous spar, with a little fluor spar and quartz.

The veins are opened by shafts and an adit. Only four shafts are now in use out of 200 which were formerly worked. The number of miners toward the close of the last century was about 4,000; now, only about 400 are employed. The vertical depth reached by some of the shafts is about 550 metres, or nearly 280 fathoms (1,680 feet) from the surface. The King's mine, which is now the richest, has reached this depth, and the collection contains a rich specimen from the bottom. An adit is driven in to intersect this mine, and drains it to a depth of 300 metres, about 975 feet. This adit is 2,000 metres (6,563 feet) in length.

The total production of the mines from the discovery to 1866 inclusive, 242 years, amounts to 820,000 kilograms of fine silver. The annual production in the last 40 years has varied from 3,500 to 8,000 kilograms of fine silver.

The following tables of the production, expenses, and profits are given by Mr. Phillips,[1] and are derived from official sources.

The total production for different years was as follows:

From 1624 to 1805	2,360,140	marks,[2]	equal to	1,332,495	pounds troy.
From 1805 to 1815	38,112	"	"	21,517	"
From 1815 to 1864	820,956	"	"	463,498	"

The average annual produce has been—

From 1815 to 1833	4,141	marks,	equal to	2,338	pounds troy.
From 1834 to 1838	27,423	"	"	15,483	"
From 1839 to 1843	25,454	"	"	14,361	"
From 1844 to 1848	23,464	"	"	13,247	"
From 1849 to 1853	20,552	"	"	11,603	"
From 1854 to 1858	32,862	"	"	18,553	"
From 1859 to 1863	16,091	"	"	9,084	"

From 1859 to 1864 the annual yield has been—

1859	20,515	marks,	equal to	11,582	pounds troy.
1860	18,139	"	"	10,241	"
1861	14,823	"	"	8,369	"
1862	13,088	"	"	7,389	"
1863	13,890	"	"	7,842	"
1864	13,046	"	"	7,365	"

[1] Metallurgy of Gold and Silver, pp. 254, 255.

[2] The mark of Norway and Sweden is equivalent to 3.252 grams, or 6.775 oz. troy.

In addition to the mines of Kongsberg, some veins in the district of Skara were formerly of considerable importance, but are now abandoned, although the fahlbands of this locality closely resemble those which have proved so productive in the adjoining district.

The produce, expenses, and net profits of the Kongsberg mines during the last 31 years have been as follows:

Statistics of the Kongsberg mines.

Year.	Produce sold.	Expenses.	Net profit.	Year.	Produce sold.	Expenses.	Net profit.
1834.....	£87, 558	£17, 407	£70, 151	1851.....	£38, 140	£15, 975	£22, 165
1835.....	50, 171	16, 215	33, 956	1852.....	40, 770	16, 905	23, 865
1836.....	70, 244	13, 585	56, 659	1853.....	36, 363	16, 444	19, 919
1837.....	52, 087	21, 015	31, 072	1854.....	51, 616	17, 984	33, 632
1838.....	58, 137	21, 258	36 879	1855.....	82, 448	20, 294	62, 154
1839.....	69, 879	20, 110	49, 769	1856.....	66, 922	19, 613	47, 309
1840.....	64, 236	20, 497	43, 739	1857.....	49, 627	17, 886	31, 741
1841.....	50, 009	22, 030	27, 979	1858.....	84, 356	20, 136	64, 220
1842.....	42, 915	19, 524	23, 391	1859.....	41, 888	20, 996	20, 892
1843.....	41, 398	19, 811	21, 587	1860.....	37, 157	23, 420	13, 737
1844.....	39, 462	18, 117	21, 345	1861.....	30, 141	24, 037	6, 104
1845.....	36, 772	16, 462	20, 310	1862.....	26, 708	20, 551	6, 157
1846.....	37, 297	12, 642	24, 655	1863.....	28, 836	20, 982	7, 854
1847.....	51, 831	19, 146	30, 685	1864.....	28, 090	21, 171	6, 919
1848.....	75, 788	16, 268	59, 520				
1849.....	49, 934	18, 621	31, 313	Averages...	£50, 750	£18, 885	£31, 704
1850.....	47, 518	16, 362	31, 156				

Among the specimens exhibited the following may be particularly noted for their beauty and rarity as crystallizations:

1. A cube of silver (crystal) three-quarters of an inch in diameter, with small and perfect octahedral planes.

2. A group of modified cubic crystals, the whole mass as large as one's fist and composed of some twenty or thirty-five crystals, all of them remarkable (as are most of the specimens from this locality) for their whiteness and brilliancy. There is a little calcite between the crystals.

3. Curiously distorted crystals in a large mass. These crystals are nearly two inches long, half an inch in diameter, and are apparently elongated cubes, curved and tapering to a point.

4. Filamentous or wire silver, in long and large masses.

5. Sulphuret of silver, a large mass.

6. Sulphuret of silver, "antimonial" (pyrargyrite?) A fine hexagonal crystal three-quarters of an inch in diameter and nearly half an inch long.

7. A large mass of dendritic crystals of sulphuret of silver.

8. Calcite penetrated by wire silver, exactly as native copper penetrates the calcite at Lake Superior.

In addition, there were some specimens of the stamped and dressed ores. The washed product contains 90 per cent. of silver, the schlichs from 1 to 1-30th of 1 per cent. of silver. The best ores may be said to contain 50 to 60 per cent. of silver, and the second class from 2 to 5 per

cent. Some large masses of native silver of irregular form attracted great attention. Pieces have often been found that weighed 100 kilograms, about 220 pounds, and some even much more. In June of this year (1867) a single blast threw out one mass of native silver mixed with sulphuret weighing 160 kilograms, (352 pounds,) and another weighing 125 kilograms, (275 pounds.) A specimen from these mines in the royal collection at Copenhagen weighs upwards of five hundred pounds.

SWEDEN.

After iron, the principal metals of Sweden are silver, copper and lead. The first two were formerly produced in much greater quantities than of late years, but the production of lead has recently increased so much that it is exported. It is obtained chiefly in the extraction of silver from galena.

The principal silver mine is at Sala in Westmannia, and yielded 1,820 pounds of pure silver in 1865, but in the 17th century it was one of the most productive in Europe.[1] This mine is said to have been worked over 500 years ago, and to have yielded in 1506 35,000 marks of silver (about 19,600 pounds troy.) It was re-opened in 1623, and in 1830 was said to be yielding 1,700 marks annually. The ore is a highly argentiferous galena.

Two other silver mines were worked in 1767, viz: Hellefors in the province of Wermland, and Segersfors in Nericia, but no account of them is given in the recent statistical publication by Ljungberg.

TURKEY.

The Ottoman government made extensive exhibitions of argentiferous lead ores from the following mines and localities: Mines of Hazme, Maghara, Hydgr, Ilias, Palata, Hassan, Ananias, Tirvir, Essad, Agha, and Koptcha; so, also, from Silvas and Amasia, and from Biga, Khodavendhiger, from the mines of Djerbiler, Milli, Kara Dagb, and Elmadjik.

ALGERIA.

The following mines and mining companies were represented by collections and specimens at the Exposition:

Kef-oum-Thebad—Silver lead company, Constantine.—Silver lead ores.

Djidjeli—Constantine, (S. Trabet, exhibitor.)—Iron, silver, copper and antimony ores.

Rouban, Gas Mines Company.—Silver lead ore.

Blidah Mines Company.—Copper and silver lead ores, and an ingot of silver.

Phillipeville—Constantine.—Silver lead ore.

[1] La Suède, son development, moral, industriel et commerciel, d'apres des documents officiels, par C. E. Ljungberg. Traduit par L. de Lilliehook. Paris, 8vo, 1867.

CHINA.

Mr. Williams states that from a memorial addressed to the Emperor of China, in 1838, it appears that most of the native silver is obtained from mines at Hoshan, in Yunnan, in the department of Tsiangchau, and at Sungsing on the borders of Cochin China. These mines are farmed out by the government to overseers, and between forty and fifty thousand workmen are employed in them who annually produce not far from 2,000,000 of taels of silver. There are other mines not so rich as these two, but which produce large amounts.[1] It is further observed that it is impossible to even guess what China receives annually from her gold and silver mines.

The following are some of the localities of silver, but many of them, probably, furnish only argentiferous lead.[2]

PROVINCE OF CHIHLI.

Shuntien (Fu) or Peking.—Silver at Mount Yunyen, 15 li south of Meyun, (hien.) Silver at Sz'ling 100 li[3] northeast of Meyun.

Yungping, (Fu.)—Silver 130 li northwest of Tsiengan, (hien;) silver at Mount Tsu, 15 li west of Lulung, (hien.) Also at Mount Yuhwang, 90 li northeast of Funing.

Siuenhwa, (Fu.)—Silver in Yu, (chau.)

PROVINCE OF SHANSI.

Kiai, (chau.)—Silver in Ngani. In Pingloh (hien) silver in several localities.

PROVINCE OF SHENSI.

Singan, (Fu.)—Silver; also at Shang, (chau.)

PROVINCE OF KANSUH.

Pingliang, (Fu.)—Silver and copper in Pingliang, (hien.) Silver and copper in Hwating, (hien.)

Kungchang, (Fu.)—Silver and copper at Mount Ningkwei, 30 li south of Ningyuen.

Tsin, (chau.)—Silver at Mount Tayang, 50 li northeast of Liangtang, (hien.) Silver in Tsingshui (hien.)

PROVINCE OF SHANTUNG.

Ichau, (Fu.)—Silver in the vicinity of gold ores at Mount Pau, 90 li southwest of Lanshan, (hien.) Silver with gold and tin at Mount Chipau, 100 li north of Ku, (chau.)

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[1] Chinese Commercial Guide, 4th edition. Canton, 1856, p. 295.

[2] This list is compiled from the volume entitled Geological Researches in China, Mongolia, and Japan, by Raphael Pumpelly. Smithsonian contributions; October, 1866.

[3] One *li* equals 1,897½ English feet, or 2.78 li a mile. A modern li, however, is one-tenth of a French league, or 1,460.44 feet.

Kingyuen, (Fu.)—Silver at Mount Mongin, 35 li northwest of Hochi, hau.)

Pingloh, (Fu.)—Silver in Pingloh, (hien.) Silver and tin in Fuchuen, ien.) Silver at Taipingyintsang in Ho, (hien.)

Sinchau, (Fu.)—Silver and lead in Kwei, (hien.)

PROVINCE OF YUNNAN.

Tsuhhiung, (Fu.)—Silver in Kwangtung, (hien,) and at Soyangtsang id Malungtsang, in Ngan, (chau,) and with lead at Yuntsungtsang in suhhiung, (hien.)

Kwangsi, (chau.)—Silver and lead at Mount Peting.

Kiuhtsing, (Fu.)—Silver and lead at Mount Yang, west of Siuenwei, hau.)

Wuting, (chau.)—Silver at Sutsuweitsang.

Pu'rh, (Fu.)—Silver at Pema, Kanku, and Mantau, in Sihma, (ting.

Yungchang and Tungchuen, (Fu.)—Silver.

Chautung, (Fu.)—Silver at Lutientsang and Lomatsang, at Tungput- ng in Chinhiung, (chau,) and at Kinshatsang, in Yunseh, (hien.)

JAPAN.

There are no reliable statistics or estimates of the amount of silver oduced in this empire. There are rich silver veins in some of the lands, and particularly at Sado, where mines have been worked for a ng time. It is certain, however, that at the present time a large part the silver used at the Japanese government mints in the coinage of zeboos is supplied by Mexican dollars, and other foreign silver coins, ken in exchange at the custom houses.

Formerly, during the period of the Portuguese and Dutch trade, large antities of silver were drawn from the country in exchange for Chinese mmodities. The Portugese trade continued for 90 years, ending in 38. For about half of this period they sent only one ship in each year, id she returned with about 600,000 *crusados*, about as many dollars.[1] we allow that the annual trade for the whole period averaged $500,000 year, a low estimate, the total export of silver was $45,000,000. The ade with the Dutch began in 1609, and it so rapidly drained the country its bullion that it required government interference, and the export of lver was prohibited. According to Arrai Tsikugo-no-kami,[2] the exports silver from 1611 to 1706 amounted to 112,268,700 taels,[3] about 61,343,500. Among the exports by the Dutch, during the last year of eir occupation of Desima, were 1,400 chests of silver, each containing 000 taels, or nearly $2,000,000.

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[1] *Vide* the account of the Portuguese trade by Ralph Fitch, cited by Hildreth. Japan as Is and Was, p. 206.

[2] Origin of the Riches of Japan, (1708.) Translated by Klaproth; Nouveau Journal iatique.

[3] The Chinese tael is worth about $1 40.

PLATINUM AND OTHER METALS.

CHAPTER VII.

PLATINUM, PLATINUM APPARATUS, PLATIN-IRIDIUM, AND OTHER RARE METALS.

EXHIBITION OF PLATINUM FROM RUSSIA—PRODUCTION OF THE METAL—CALIFORNIA AND OREGON—ANALYSIS OF THE MIXED METALS FROM PORT ORFORD—PLATINUM STILLS AND OTHER APPARATUS EXHIBITED BY JOHNSON, MATTHEY & CO.—LARGE PLATINUM INGOTS—PLATINUM ASSAY APPARATUS—MAGNESIUM—IRIDIUM—OSMIUM—SERIES OF METALS IN SPECIMENS OF EQUAL WEIGHT—MEDALS AWARDED—QUICKSILVER ORES OF CALIFORNIA AND SPAIN—PRODUCTION OF PACIFIC COAST MINES.

RUSSIA.

Paul Demidoff, of the government of Perm, exhibited a variety of samples of native platinum from various localities on his mining estates. One of these specimens was a nugget of the metal, six inches in its greatest diameter, weighing 11¾ livres, (13 pounds troy.)

Some of the samples were in fine grains and scales as separated from placer gold by amalgamation. This platinum is refined at the establishment of the exhibitor and sold at the rate of 3,100 roubles (12,400 francs) the pood, (16.380 kilograms,) delivered free of charge at Paris. There are 20 localities of platinum known upon the estates of this exhibitor, and the production of the washings since 1825 has been about 3,105 poods, but a great part of the localities are reserved. This amount corresponds to 50,859.9 kilograms, or 1,635,993.45 troy ounces. Its value, at 3,100 roubles per pood, is about $7,700,400.

A very interesting exhibit of native platinum, and the metals which usually accompany it, was made by the St. Petersburg mint, (No. 505 of the special Russian catalogue.) This collection consisted of—

	Roubles.
1. *a* Native platinum, value per livre	42.02
b Refined platinum in the state of sponge and in ingots	62.50
2. Products of refining platinum—	
a Iridosmine, value per zolotnik	0.85
b Insoluble precipitate [residue]	0.10
3. Metals of the platinum group—	
a Iridium, ruthenium, osmium, rhodium, and palladium, in a pure state.	
b Precipitated.	

Various articles manufactured of platinum and used in the laboratory of the mint, such as crucibles, spatulas, spoons, wire and retorts, were also shown.

Platinum occurs at many places in the gold region of the Urals, but principally at Nijne-Taguilsk, and in the district of Goroblagodat. The mines of Demidoff are at Taguilsk. The production of this metal up to the year 1834, according to M. Tegoborski, amounted to 103 poods and 24 livres, and the annual production was afterwards increased, but in 1847 it had diminished to 18 livres, 92 zolotniks, representing a value of 2,250 roubles. Tchevkine and Ozersky estimate that since the discovery of the metal in 1824 up to the year 1851, there had been 2,061 poods produced, of which 1,990 poods came from Nijne-Taguilsk alone, and 32 poods from Goroblagodat, and the remainder from the different gold washings of the Urals.[1] The official information furnished at the Exposition shows that the production has greatly diminished since the government ceased to use the metal for coins, and that the annual production now varies from 30 to 140 poods. The following is the production for the years named:

	Poods.		Poods.
1860	60	1862	142
1861	105	1863	30

This is an average of about 44,390 troy ounces, or 3,700 pounds troy per annum.

The *pépite* shown in the Demidoff collection is not the largest that has been found. One has been obtained weighing 16 pounds, and another nearly 23 pounds. Many of the nuggets shown at the Exposition possessed polarity in a high degree, and were so highly magnetic as to attract and hold iron filings like magnetic iron ore. This metal was formerly coined by the Russian government into pieces of 11 and 22 roubles each, and the amount coined from 1826 to 1844 equalled $2,500,000.[2]

CALIFORNIA AND OREGON.

Grains and scales of platinum and the associate metals occur sparingly with the gold in almost all parts of the California gold field, but they are most abundant in the northern mines. At Port Orford and its vicinity, on the coast, these metals constitute a very large part of the product of the washing of the black sand of the beach for gold. The metals cannot be separated by washing, and the gold is extracted by the aid of quicksilver. The residue consists of minute scales and grains of platinum and platin-iridium, most of which are lifted by a magnet. This mixture was first brought from California by the writer in 1854, and an analysis

[1] *Vide* Dallóz, ii, pp. 360, 361.

[2] Dana's System of Mineralogy, p. 13.

of it by Mr. Charles A. Kurlbaum, jr., in Dr. Genth's laboratory, showed it to have the following composition:[1]

Insoluble in aqua regia, osmiridium	48.77	Gold	1.32
Platinum	43.54	Silver	0.13
Iridium	0.60	Copper	0.32
Rhodium	0.28	Lead	0.03
Palladium	0.49	Iron	4.52

GREAT BRITAIN.

Although this country does not produce platinum and the associate rare metals, the honor of working them into the most perfect and largest vessels for economical uses must be given to its artisans. The most prominent and interesting display of the precious metals, including platina in its raw and manufactured state, at the Exhibition, was made by the firm of Johnson, Matthey & Co., of Hatton Garden, London. The various objects exhibited are enumerated in the following descriptive list prepared from the data given in the circular furnished by the firm:

PLATINUM APPARATUS.

Platinum stills and syphons.—One still to concentrate 8 tons (8,000 kilograms) of sulphuric acid per day. Value £2,500, (62,500 francs.)

One still to concentrate 5 tons (5,000 kilograms,) of sulphuric acid per day. Value £1,640, (41,000 francs.)

These stills comprise several new improvements, the most remarkable of which is that they are made without gold-soldered joints, so that the whole boiler is formed, so to say, of but one solid piece of metal. This is effected by autogenous soldering, which important improvement not only renders these vessels stronger, more durable, less liable to leakage and want of repair, and less costly than those made upon the old plan, but also enables the gauge of the metal to be regulated in accordance with the wear and tear to which the different portions of the still are exposed, saving unnecessary weight of metal where thickness is not required. These magnificent specimens of autogenous soldering deserved a minute and careful examination. The metal of which these boilers are manufactured is of absolute chemical purity.

Platinum syphons.—The improvements shown were of considerable importance. By means of the ball and socket joint the tubes can be adjusted to any required angle, and can be removed with facility. The platinized bronze clamps formerly used, which constantly required renewal, are entirely dispensed with. To facilitate packing and cleaning, the branch tubes are also made with double joints in the middle.

Improved platinum syphon.—For use in gold and silver refineries.

Platinum alembic.—For use in mints, refineries, and chemical manufactories; generally employed for the separation of gold and silver, but so constructed as to be capable of adaptation to all ordinary purposes. Value £300, (7,500 francs.) By the use of such an apparatus not only

[1] Report of a Geological Reconnaissance of California, p. 300.

is great economy and rapidity effected in refining, but this operation is conducted with much greater certainty and safety.

Platinum still-head and arm—Of a new shape for sulphuric acid boilers. By this simple alteration an immense saving is obtained, the production of concentrated acid is increased, and the weak acid which is condensed in the leaden worm is reduced in strength 30 per cent.

Platinum distilling apparatus and tube.

Platinum ingot—Prepared of chemically pure metal and forged in one mass. Value £1,100, (27,500 francs.) With such an ingot a whole body of a 5-ton boiler (such as was shown) can be manufactured.

Model of an ingot—Of pure platinum melted by Messrs. Johnson, Matthey & Co., by the heat of the compound blowpipe. Weight 3,250 ounces, (100 kilos.) Value, £3,400, (85,000 francs.) This enormous ingot was melted for the Exhibition of 1862, where it was exhibited for six months.

Pure platinum melted—By the intense heat of the compound blowpipe. Three ingots, value, £540, (13,000 francs.)

Platinum tubes.—These tubes are made of every length and size, and autogenously soldered. In strength and durability they are superior to those made with gold solder, and also to those made by pressure, as they escape the severe strain which the thick metal, of which pressed tubes are necessarily made, must undergo.

Platinum steam coil—Made of pure platinum tubing autogenously soldered. Value, £800, (20,000 francs.) Manufactured for Messrs. Crosse & Blackwell, and used by them for boiling their pickling vinegar. The length of the tube was about 32 feet, (9.660 metres,) diameter 1½ inches (4 centimetres.) They also exhibited an aluminium steam pan for boiling preserves.

Platinum wire—Sheet, foil, gauze, crucibles, capsules, dishes, pans, lightning conductors, &c., &c.

Platinum plate—Soft, half-hard, and hard.

Platinum assay apparatus—By the use of which gold assays can be made with the greatest accuracy and rapidity.

Iridio-platinum—(Matthey's alloy,) expressly prepared for vents or bushes for heavy ordnance. One vent, loaned by Mr. Whitworth, was exhibited in section. It has fired 3,000 rounds from a Whitworth cannon, and scarcely shows wear.

Platinum in various forms—Native, sponge, alloy, salts, plated on copper and on silver, for scale pans and philosophical instruments. Platinum granulated and alloyed with iridium, 10, 15, and 20 per cent.

RARE METALS AND COMPOUNDS.

Precious and rare metals—In the native state and in prepared forms. These formed a series of cylinders weighing one kilogram each (about

two pounds) of the following noble, rare, and common metals of chemical purity and cast in a symmetrical form to demonstrate to the eye their respective specific gravity and their characteristic qualities when cast: Gold, silver, platinum, iridium, rhodium, osmium, palladium, lead, bismuth, copper, cadmium, cobalt, nickel, iron, antimony, zinc, magnesium, aluminium, thallium, sodium, mercury.

Samples and preparations of rare metals, and of the non-metallic elements, boron and silicon.

Sodium amalgam—As used (under the patents of W. Crookes, esq. F. R. S.) for the extraction of gold and silver from their ores.

Magnesium in ingots, plates, bands, rods, wire, ribbon, lamps, &c.

Chemical and metallurgical products.—Nitrate silver, in all commercial forms, chloride of gold, salts of platinum, iridium, rhodium, palladium, gold, silver, copper, cobalt, cadmium, lead, antimony, arsenic, mercury, nickel, tin, zinc, &c.

A series of the salts of uranium.—New colors for enamel painting, chromo-lithography, and decoration, manufactured by an entirely new process, by means of which great brilliancy, durability, and harmlessness are insured at a less cost than that of ordinary colors.

A series of native gold specimens, nuggets and dust from various parts of the world, illustrating their various characteristics and natural forms.

A series illustrating the two processes of refining the precious metals, and preparing them for coinage and for manufacturing purposes, showing the various crude forms in which they reach England; the metals and their solutions; the various stages of the refining and melting processes. Also the secondary products—the pure salts and metals, and the condition in which they are delivered over for coinage and other purposes.

The total value of the whole series was estimated at £20,000, or about $100,000.

The large platinum stills are nearly four feet in diameter, and they are splendid specimens of the art of working this metal, which is now based upon the production of large homogeneous ingots by fusion before the oxyhydrogen blowpipe. It is stated by the exhibitors that the ingots, which are about as large as common bricks, were melted according to the method of St. Claire Deville and Debray. This method is one of the direct gifts of science to the arts, and was first proposed by Dr. Hare of Philadelphia, who, in 1837, melted 28 ounces of platinum into one malleable homogeneous mass.

The platinum assay apparatus appears to be a great improvement over the apparatus in ordinary use, and it is said to give more exact results.

It consists of two shallow kettles of platinum, about a foot across the top, set in holes, in a platform, like those in the top of a stove, so that heat from a gas-lamp can be applied below. The nitric acid for dissolving the silver out of the assays is placed in these kettles and heated. A frame of platinum made to fit the interior of the kettles is divided by thin partitions into 200 or more little compartments, into each of which

a little platinum cup is placed. These cups are about as large as a child's thimble, and are intended to hold the assay. They are made so as to be easily taken out or replaced in the frame, and the bottom is pierced with fine slits at right angles, so that the hot acid can enter when they are lowered with the frame into the kettle, and so that the acid may drain out when the frame, with contents, is raised. By means of this apparatus the pouring off of acid and the separate washing of each assay is avoided. It has been in use for five years in the laboratory of the firm with complete success. The whole apparatus, with two kettles, is about two feet long and 13 inches wide. A porcelain hood covers the kettles and condenses the acid vapors, discharging them into a vessel at one side.

The same firm exhibited a block of pure magnesium, weighing five kilograms, about 11 pounds. The metal was also shown in large quantities in the shape of foil for galvanic batteries, ribbons for showing the magnesium light, and in coils of wire of various sizes.

Iridium, osmium, and other rare metals.—This display of the rare metals was the most complete that has ever been made, both in number and in quantity. Some of the rarest elements which are seldom seen, even in small grains, were here shown in massive ingots. A bar of platin-iridium, nearly three inches long, was solid, compact, and homogeneous. This is the second which has been made, and it was formed by melting up small grains not much larger than the tips of a gold pen. This alloy has been made by Mr. Matthey for the vents or bushes for heavy ordnance, for which it is peculiarly fitted by its great hardness and indestructibility.

The bar of osmium presents a totally different appearance from the iridium, and resembles a mass of ordinary coke. Ruthenium is the only one of these extremely rare metals which is shown in small quantity, being represented by a few masses about the size of peas.

In the series of metals cast in rods, weighing one kilogram each, for the purpose of showing their bulk relatively to their weight, the metals which oxidize rapidly on exposure to the air, and quicksilver, which is fluid at ordinary temperatures, are confined in glass tubes. These tubes have the same internal diameter as all the rods of the series—about one inch.

The platinum cylinder is about four inches long; the quicksilver about seven inches; and the others elongate by a very regular gradation up to the metal aluminium, which towers two feet above the metal which precedes it, and is in its turn overtopped by the rod of magnesium, which is nearly four feet long—about twelve times longer than the platinum cylinder of the same weight.

The firm which made these interesting and instructive exhibitions received three medals, two of gold and one of silver, as follows:

"For progress in metallurgy and refining the precious metals," a gold medal.

"For improvements in the construction and manufacture of platinum

sulphuric acid stills and apparatus, and for perfection in working the precious metals," a gold medal.

"For nitrate of silver, chloride of gold, and chemical and metallurgical preparations," a silver medal.

QUICKSILVER OF SPAIN AND CALIFORNIA.

In the mineral exhibition made by Spain there was a series of large and splendid specimens of cinnabar and of native quicksilver, which fully illustrated the celebrated mine of Almaden. This was by far the finest display of quicksilver and its ores in the Exposition, and was calculated to impress all who saw it with the superior richness of the mine. The ore is not so brilliant and high-colored as the cinnabar of the New Almaden mine, in California; it is brownish and brick-red, looking more like peroxide of iron. The Almaden has been worked since three centuries before the Christian era, and it produces from 20,000 to 22,000 Spanish quintals (2,000,000 pounds to 2,235,000 pounds) of quicksilver annually. The statistics for 1862–'63 show that 113,266 metric quintals of ore were extracted, and that 2,443 workmen were employed.

The collections from the Pacific coast contained suites of specimens from the New Almaden mine; the New Idria, in Fresno county; and from other localities in California, and several interesting specimens from a new locality in Idaho. These last consisted of carbonate of lime—limestone—with disseminated patches and nodules of cinnabar of great purity and high color. Quartz is not present. Carbonate of lime appears to be as much the gangue or vein stone of cinnabar, as quartz is of gold. The following data upon the present production and export of quicksilver in California are from the Mercantile Gazette and Annual Review for 1867:

"With the opening of new mines and the extension of those already opened, the capacity for the production of this metal in California is being rapidly enlarged. In fact, enough could easily be turned out here to supply the requirements of the whole world without severely taxing the energies of the mines now being worked or in course of development. In fact, it is the question of a market rather than the supply of ore that most concerns the owners of these properties; and since this is an article of limited use, being restricted to a few specific purposes, the consumption is not, like many other commodities, greatly affected by the price. With the extension of mining operations and the arts of civilized life, there must, of course, be a corresponding increase in the demand for this metal, yet these are slow and inconsiderable compared with the rapid increase in the power for producing it that is going on in this State.

"The New Almaden mine, which has now been worked nearly 18 years, with a steady increase of productive power, when worked to its full capacity, is still turning out at the rate of over 30,000 flasks annually, the ore deposits being abundant, with large reserves extracted and retained for reduction when the demand may call for it. The total yield

of this mine since it was first opened approximates half a million flasks, worth, at the lowest calculation, $20,000,000. This company has a capital of $10,000,000, employ a force of about 1,200 hands, and are subject to an average yearly expenditure of over $700,000. About one year ago the company made large additions to their reduction works, increasing their capacity and introducing many valuable improvements, whereby they have been enabled to treat with profit a lower grade ore than before. The New Idria mine, situated on the easterly slope of the coast range, in the western part of Fresno county, after having been restrained from being worked for several years through legal proceedings, resumed operations over a year ago, since which time it has been worked vigorously, and with success, nearly 300 hands having been employed, and the ore yielding about the same per cent. of metal as that from the New Almaden mine. About 12,000 flasks of quicksilver are turned out at this mine annually, and the ore deposits are represented as looking extremely favorable. At the Chapman or San Juan Bautista mine, recently opened on Chapman's ranch, three and a half miles south of San José, furnaces have been erected capable of reducing 17,000 pounds of quicksilver per month. About 1,000 tons of ore have been raised, which yields at the rate of 10 per cent. of metal, and the deposit in the mine appears to be large. This mine is turning out about 300 flasks of metal per month, a rate of production that it is thought can be kept up and perhaps largely increased. The Redington mine, situate in Lake county, about 50 miles north of Suisun City, employs 200 men, and is turning out about 1,000 flasks of quicksilver monthly. Extensive improvements have been made at this place, and it is considered a valuable property, as the deposits are extensive and the ore of fair grade, while the facilities for insuring economical reduction are many. In Pope valley, Napa county, a valuable deposit of quicksilver has been developed within the past year. Quite recently furnaces having a capacity for reducing eight tons of ore daily, with other works, have been erected at this place, all of which, should first trials warrant, will be largely added to the ensuing spring.

* * * * * * * * *

"The three year contract purchase expires in April next; during its existence the product of the State has been largely increased, not only by the companies interested, but by the resumption of the New Idria Company, long closed by an injunction issued out of our courts. At present the monthly production of the New Almaden Company is placed at 2,500 flasks—Redington Company upwards of 1,000. The Chapman Company is largely owned and controlled by same stockholders, will soon produce 300 flasks monthly; besides these, the product of the New Idria and the Guadalupe, and others about commencing operations, must be added; it is safe to place the total monthly production of the State at upwards of 4,000 flasks, or say 50,000 in 1868. Of the entire product of the State since the first opening of the mines we have no reliable data as to quantity. Our first exports of which we have any knowledge

were in 1852, when 900 flasks were shipped abroad; in 1853, 12,737 flasks; increasing rapidly until 1859, when government took possession of the New Almaden mine, then the exports declined in that year to 3,399 flasks as against 24,142 the year previous. In 1860 but 9,448 flasks were exported, but in the year following work was again resumed at the mine, and shipments at once increased to about 36,000 flasks, and have continued to this date upon a liberal scale, so that for a period of 15 years we have sent abroad about 390,000 flasks, of the approximate value of $16,000,000. The present stock in the State is upwards of 10,000 flasks. The export price during the continuance of the three-year monopoly was, we believe, uniformly 55 cents, and for local use 60 cents per pound. The contracting parties referred to have themselves been large exporters during the entire period of their contract, and have, to a considerable extent, had the monopoly of the markets of the world—at least those available to us—and when any disposition was shown by outsiders to purchase for export, the proposed destination was required before naming the price—hence the difficulty for months past of giving any reliable market quotation. The companies, books, and operations generally, as well as actual products of the mines, have all been closed to the outside world during the entire contract period of three years. What is to be the future of the market we know not, but from present indications prices are likely to rule low, chiefly for the want of an outlet commensurate with the increased product of the State. The local consumption of the coast has been computed at about one-third of the average production. In regard to the Redington Quicksilver Company, no new facts of general interest have transpired since last year. Two hundred men are now employed; the production for the incoming year estimated at 1,000 flasks per month—if ore should improve it will be larger; with ore of present grade and with present capacity of works and force employed will produce somewhat over 1,000 flasks monthly, while by enlarging works and increasing number of hands, could, with present class of ores, produce much more, but it is no object to do so at present prices, or rather limited consumption, for the real trouble is want of an enlarged market. Deposits of ore in this mine are no doubt extensive, and thus far have proved of fair grade. Facilities for working the mines and reducing the ores are good, with railroad transportation, of which there is a prospect at an early day, the cost of shipment to market will be materially reduced."

The following are the receipts of quicksilver in San Francisco for each month during three years to 1868, and the sum total thereof as far as can be ascertained. These receipts came over the San Francisco and San José railroad, and include the New Almaden, New Idria, and Chapman mines. The parties interested in other mines withheld their figures for reasons best known to themselves, but those given are a fair criterion of the product of this metal during 1867. The receipts were as follows:

Production of quicksilver in California.

	1865.	1866.	1867.
	Flasks.	*Flasks.*	*Flasks.*
In January	3,768	4,524	2,342
In February	3,512	3,684	711
In March	3,427	4,557	987
In April	4,050	2,536	9,727
In May	4,501	2,877	6,117
In June	4,000	3,415	2,699
In July	3,710	3,830	1,611
In August	4,500	3,779	988
In September	4,606	3,491	2,242
In October	3,010	4,080	6,014
In November	3,839	2,221	4,134
In December	4,271	1,731	1,531
Totals	47,194	40,725	39,103

In addition to the above, the Redington Company produced on an average about 1,000 flasks per month, which would increase the receipts for 1867 to 51,103 flasks.

The exports to the different countries for 1867, and the previous three years, were as follows:

Exports of quicksilver, 1864–1867.

	1864.	1865.	1866.	1867.
New York	1,495	6,800	3,800	2,900
Great Britain	1,609	10,400	3,000	1,500
China	18,908	14,248	10,252	10,011
Mexico	7,483	2,789	9,561	10,042
South America	7,974	7,500	3,000	3,800
Australia	100	200	575	300
British Columbia	21	24	6	20
Other countries	337	508	93	280
Total flasks	36,927	42,469	30,287	28,853

And the exports previously have been:

	Flasks.		*Flasks.*
In 1863	26,014	In 1857	27,262
In 1862	33,747	In 1856	23,740
In 1861	35,995	In 1855	27,165
In 1860	9,448	In 1854	20,963
In 1859	3,399	In 1853	12,737
In 1858	24,142	In 1852	900

Each flask contains about 75 pounds of metal.

PRODUCTION AND CONSUMPTION OF GOLD AND SILVER.

CHAPTER VIII.

AGGREGATE PRODUCTION OF THE PRECIOUS METALS.

DIFFICULTY OF OBTAINING STATISTICS FOR EARLY PERIODS—ESTIMATES BY JACOB AND OTHERS—HUMBOLDT'S ESTIMATES AND STATISTICS FOR THE PERIOD FROM 1492 TO 1803—DANSON'S STATEMENTS OF PRODUCTION IN MEXICO AND SOUTH AMERICA—RÉSUMÉ OF PRODUCTION TO 1803—PERIOD FROM 1803 TO 1848—PRODUCE OF AMERICAN AND OF EUROPEAN MINES—PERIOD FROM 1848 TO 1868—MAXIMUM YIELD IN 1853—PRODUCTION AT THE PRESENT TIME OF GOLD AND SILVER—SILVER PRODUCT INCREASING WHILE GOLD IS DECREASING—ESTIMATES BY NEWMARCH OF MEAN ANNUAL PRODUCTION—TABLE OF AGGREGATE PRODUCTION FOR TWENTY YEARS—SUMMARY.

ESTIMATES OF PRODUCTION TO 1803.

In this chapter the attempt is made to present a résumé of the aggregate amount of gold and silver added to the stock of the world in historic times, and to show the production and consumption of the precious metals at the present time, based upon the statistics given in the foregoing pages and other sources, in order to show approximately the present annual production of the precious metals, and to compare this production with that of other periods. In regard to the general estimates of aggregate production, and especially in regard to those anterior to the 16th century, it is necessary to premise that precision is impossible. Statistics are not attainable, and the field is open for conjecture. Jacob, who in 1831 published his Historical Inquiry into the Production and Consumption of the Precious Metals, has attempted to give a connected view of the production of the precious metals from the most remote ages to the discovery of America and onward to the date of his publication. Without assuming the correctness of these estimates it may be well, in the absence of any others, to present a brief view of them as an introduction to the more precise and certain data given to us by Humboldt and other writers for the period from the discovery of America to the commencement of this century.[1]

[1] McCulloch in his article upon the precious metals, (Encyclopedia Britannica, 1859,) says that the difficulty of investigation of the production and consumption of the precious metals "is at least as great as their importance. They are not in truth of a kind to afford any certain conclusions, and we must be contented with those that seem to present on the whole the greatest amount of probability." He does not think that any reliance can be placed upon the accuracy of the estimates made by Jacob and others upon the production during early periods.

Jacob assumes as a basis of an estimate that the quantity of money
existence at the time of Augustus was about £358,000,000. He esti-
ates the loss of gold and silver by wearing to be at the rate of one
rt in 360 annually, so that a gold or silver coin weighing 360 grains
ould lose a grain in weight yearly, or a 36th part in 10 years, and
on this supposition he presents a table showing the decrease in the
antity of gold and silver money in the Roman empire between the
ath of Augustus, in the year 14, and the termination of the western
pire, in the years between 470 and 490, and extends the same hypo-
etical calculation to the year 806. By this constant deduction of 10
r cent. for wear at the end of each period of 36 years, he reduces the
tire amount to about £35,000,000 in the year 800. But exception may
stly be taken to this large allowance for loss by wearing while no addi-
n is made for the accessions to the stock by mining during that period.
cob himself says that the supplies from the mines of gold and silver
d not wholly ceased in the reign of Augustus, but the products
re trifling, and in the earlier years comprehended in his table had the
ect of slightly lessening the decrease.

It is impossible to form more than a conjecture of the quantity of
ecious metals produced from the year 800 onward to 1492, the date of
e discovery of America; but Jacob, who made a careful investigation
on this point also, was disposed to conclude, as far as any judgment
uld be formed from the few attainable facts, that the whole quantity
elded by the European mines during that period did not average more
an about £100,000 annually, and that it certainly was not more than
fficient to supply the loss by waste and wear, and thus to keep the
ck on hand about equal to what it was in the year 800. Calculation
ows that the amount required upon this hypothesis is, for the 692
ars, £69,200,000. It appears by these estimates, which, however,
ay be regarded as too low, that at the time of the discovery of America
e quantity of the precious metals in existence in Christendom did not
nount to more than about £35,000,000, and had been steadily decreas-
g for several centuries, or, at least, the annual supply was not more
an sufficient to supply the waste. From that time there has been a
ntinuous although variable increase. This increased production ap-
ars to have resulted not only from the influx of gold and silver from
e New World, but also from the remarkable stimulus which these new
scoveries gave to mining industry throughout Europe. Jacob says
at "the discovery of America and of the mines it contained seems to
ve kindled a most vehement passion for exploring the bowels of the
rth in search for gold in most of the countries of Europe." There was
fact a great mining excitement, and between the years 1538 and 1562
re than a thousand leases of mines were taken.

For the eight years from 1492 to 1500 Humboldt estimated that the aver-
e annual supply of the precious metals to Europe from America was about
2,000 sterling. The first large shipment of gold to Europe was by

Orando in 1502, and amounted to about £70,000 sterling in value, but greater part of this was lost by the wrecking of the vessels in a g storm.

It is believed that the gold collected by the various explorers of Ame from the year 1500 to the invasion of Mexico by Cortez in 1519, have equalled, but did not exceed, the amount which Humboldt estim as the annual product between 1492 and 1800, or £52,000 sterling annum.

When Cortez invaded Mexico he received presents from Montez equal to nearly £70,000 sterling in value, and the tribute paid must h amounted to £65,000 more. Bernal Diaz states that the plunder w fell into the hands of the Spaniards at the capture of Tenochtitlan equivalent to £80,000.

Twenty years later Peru was invaded by Pizarro. Here, also, min the precious metals had long been wrought for the Incas, but the supply of silver appears to have been obtained from argentiferous In 1545 the rich mines of Potosi were discovered, and this marks a era in the production of silver. In 1630 the veins of Pasco were covered, and those of Gualgayoc in 1771.

Taking Humboldt's estimate of an average annual production of £52 Jacob extends his calculations as follows: The increase in the pro tion was—

From 1492 to 1521, 29 years, at £52,000	£1,308
Capture of Mexico (1521) to 1545, 25 years, at the annual rate, as estimated by Humboldt, of £630,000	15,750
Total addition in 63 years	17,058
Add stock on hand in 1492	33,674
Total to 1545	£50,732

From this period onward the annual average production in the A cas is estimated to have approached $10,000,000, or about £2,100 In Europe the production was enhanced to about £150,000 annu At this rate of supply for 54 years, to 1600, the total amount was a £121,500,000. To this calculated amount, including the amount of a £50,000,000 on hand in 1545, he applies the same estimated reductio wear, or one-tenth part in 36 years, and thus reduces the estimate o stock of precious metals at the end of 1599 to about £155,000,000.[1]

In his succeeding estimates up to the beginning of this centur places the amount on hand in Europe at that time, after deducting had been sent to Asia, and what was supposed to have been used i arts, at £130,000,000. In respect to the shipments of gold to Asia, to the amounts which are deducted, he observes:

"In the absence of any precise facts, and with but little confiden

[1] It will be noted that there is a discrepancy between this amount and that in the sum on page 204, which is there explained.

)roximation to accuracy, we may venture to suppose that the
ıs metals which passed from Europe to Asia in the 112 years, from
ıt discovery of America to the end of the 16th century, amounted
tenth of the whole quantity produced, or about £14,000,000; and
y further suppose that one-fifth of the gold and silver had been
:ted from its primary use as money and converted into other com-
:s, either for use or ornament."

explanation will be sufficient to introduce the figures which follow,
:d from the estimates made by that author:[1]

)n hand in 1492			£34,000,000
tion 1493–1599 over loss and wear ..		£138,000,000	
ı the arts	£28,000,000		
Asia.....	14,000,000		
eductions 1493–1599.....		42,000,000	
n 1493–1599.....			96,000,000
n hand at the end of 1599.....			130,000,000
tions of XVIIth century.....		337,500,000	
Asia.....	£33,250,000		
ı the arts	60,250,000		
nd loss.....	77,000,000		
:duction for XVIIth century.		170,500,000	
n of XVIIth century.....			167,000,000
n hand at the end of 1699.....			297,000,000
ions of 1700 to 1809		880,000,000	
Asia	£352,000,000		
ı the arts	352,000,000		
nd loss.....	93,000,000		
eductions 1700 to 1809		797,000,000	
n from 1700 to 1809			83,000,000
n hand at the end of 1809			380,000,000
tion from 1810 to 1829		103,736,000	
Asia	£40,000,000		
the arts	112,252,220		
nd loss.....	18,095,220		
:ductions from 1810 to 1829.....		170,343,440	
e from 1810 to 1829.....			66,611,440
n hand at end of 1829.....			£313,388,560

[1] See "Historical Inquiry," &c., ii, pp. 70, 131, 214.

This tabular presentation up to 1809, and the statements which
it, may be analyzed as follows:

Analysis of Jacob's estimates.

Period.	Amount on hand and production.	Loss and wear.	Used in arts.	Ser
On hand in time of Augustus, year 14	£358, 000, 000			
Year 14 to 806		£324, 000, 000		
806 to 1492	[1]69, 000, 000	69, 000, 000		
1492 to 1599	[2]138, 500, 000	18, 500, 000	£28, 000, 000	£
1600 to 1699	337, 500, 000	77, 000, 000	60, 250, 000	
1700 to 1809	880, 000, 000	93, 000, 000	352, 000, 000	3
Total	£1, 783, 000, 000	£581, 500, 000	£440, 250, 000	£3

The sum of these deductions thus made by Jacob is £1,421,000,0
the total production, £1,783,000,000; or, in dollars, in round nu
$8,915,000,000.

I have been thus particular in presenting these estimates by
in order that readers may form their own conclusions in respect t
accuracy or claims to adoption. It appears improbable that the
wear has been as great as Jacob assumes, and much more doubtf
the production of gold and silver utterly ceased during the perio
the reign of Augustus to 800. It is more reasonable to believe th
supply was at least equal to the waste by loss and wear. Gold-d
is an occupation which may be followed in the most dark and ti
times, and by savage races, and as we have no reason to conclude t
purchasing power of the precious metals was impaired during that
the usual inducement for their extraction from the earth remaine

HUMBOLDT'S STATISTICS.

For the statistics of the production of gold and silver in Ameri
the discovery of the country to the year 1803, reliance is placed
upon the celebrated work of Baron Humboldt, the "Political Essa
the Kingdom of New Spain," in which, in addition to an account

[1] Jacob, in chap. xiv, page 361, assumes that the annual production of gold fro
1492, a period of 690 years, was about £100,000 per year, and inasmuch as the a
circulation at both periods was nearly the same, the production was only sufficien
pensate for the loss by wear; £69,000,000, therefore, represents both the production

[2] There is here a discrepancy in Jacob's statements. In the table, and the t
which it is taken, (ii, page 70,) he gives £138,000,000 as the production in that pe
and above the loss by wear. But the data he gives on pages 52, 53, and 62, show a
tion from 1492 to 1546 of £17
1546 to 1599 of 12
Total £13

And the statements of loss by wear on pages 54 and 63 amount to £18,482,000
amounts, including also the wear on the before existing £34,000,000. And he furth
the amount on hand at the end of 1599 as about £155,000,000.

aminations of the mines made by him, all the available data relating o the subject of the production and export of the precious metals are rought together.

This eminent authority estimates that the annual average supplies of he precious metals derived from America were as follows:[1]

	Average per year.		Average per year.
rom 1492 to 1500...	$250,000	From 1600 to 1700..	$16,000,000
rom 1500 to 1545...	3,000,000	From 1700 to 1750..	25,500,000
rom 1545 to 1600...	11,000,000	From 1750 to 1803..	35,300,000

In a recapitulation of the value of the gold and silver raised from the nerican mines from 1492 to 1803, he estimates the amount—

Registered:	Piastres.
om Spanish colonies	4,035,156,000
om Portuguese colonies	684,544,000
Not registered:	
om Spanish colonies	816,000,000
om Portuguese colonies	171,000,000
Total	5,706,700,000

These statements, and the tables in detail, by Baron Humboldt, upon ich they are founded, have been carefully studied and compared by . Danson, who finds reason to amend them. In an elaborate article blished in 1851,[2] he reviews the subject, and presents the following ended statement, which reduces the total, as given by Baron Humdt, by 138,506,000 piastres, or a little more than two per cent.

Amended statement.

Country.	Registered piastres.	Contraband piastres.
n New Spain, (gold and silver)	1,767,952,000	260,000,000
n Peru, viz: Potosi, Pasco, Gualgayoc, Huantajaya, &c., (silver)	1,769,698,000	434,000,000
n the Spanish colonies, &c., under New Spain, (gold)	332,000,000	82,000,000
n Brazil, (gold)	737,544,000	185,000,000
	4,607,194,000	961,000,000
	961,000,000	
Grand total, (piastres)	5,568,194,000	

this whole amount, 1,415,544,000 piastres (exchange at 4*s.* 3*d.*, ,803,100) is supposed to have been gold, and 4,152,650,000 piastres

[1] Sur La Nouvelle Espagne, iii, 428, 2d ed.

[2] the quantity of gold and silver supposed to have passed from America to Europe from covery of the former country to the present time, by J. T. Danson." Read before the tical Society of London, December 16, 1850, and published in the Journal, vol, xiv, 1851.

(£884,350,635) silver. But this does not show the amount of the preci metals taken to Europe. An allowance is to be made for the quan retained in America, and for such portions as were exported to ot countries than Europe. Humboldt estimated this down to 1803, at annual average of 600,000 piastres. Danson observes that in Humbol estimates no allowance is made for wear and for the casual losses during three centuries, and allowing for gold and silver together only one-fou of one per cent. per annum, on a probable average of 50,000,000 piast in use, he makes the total to be deducted 37,500,000 piastres, as shown the following amended account, which he presents:

	Piastres.	Piastres.
Gold in use in America at the arrival of the Spaniards..		40,000,(
Gold and silver raised from the mines between 1492 and 1803		5,568,194,(
		5,608,194,(
1. Deduct the quantity probably consumed in America during the three centuries ended in 1803	37,500,000	
2. Also the quantity supposed to be remaining in America in 1803	153,000,000	
3. And the quantity supposed to have been sent elsewhere than to Europe	133,000,000	
		323,500,(
Total value of both metals sent to Europe down to 1803..		5,284,694,(

or, sterling exchange at 4*s.* 3*d.*, £1,122,997,475.

Danson observes that this is apparently the best account that can framed down to 1803.

Humboldt gives the following estimate of the production of the mi of the New World at the commencement of this century:[1]

Annual produce of the mines of America at the commencement of the n teenth century.

Political divisions.	GOLD.		SILVER.		Value of and silv dollars.
	Marcs of Castile.	Kilograms.	Marcs of Castile.	Kilograms.	
Viceroyalty of New Spain	7,000	1,609	2,338,220	537,512	$23,00
Viceroyalty of Peru	3,400	782	611,090	140,470	6,24
Captain Generalship of Chili	2,212	2,807	29,700	6,827	2,06
Viceroyalty of Buenos Ayres	2,200	506	481,830	110,764	4,85
Viceroyalty of New Granada	20,505	4,714	.....	.....	2,99
Brazil	29,900	6,573	.....	.....	4,36
Total	75,217	17,291	3,460,840	795,581	$43,50

[1] Cited by McCulloch Ency. Brit., xviii, 460.

He further estimated the production at that time of the European ines and those of northern Asia at about £1,000,000 in addition.[1]

Chevalier also, citing from Humboldt's New Spain, says that Humldt calculated that the gold production of America, Europe and siatic Russia amounted to 15,800 kilograms,[2] (£2,180,400.) Chevaer considers it doubtful if the gold which the Christian nations drew om other sources, and especially from Africa, added a weight of 2,000 lograms (£276,000) to this supply. He therefore estimated that 18,000 lograms, valued at £2,484,000, or about $12,420,000, would cover the nount of gold which then reached the Christian nations.[3] By including e island of Borneo and several other localities in the Indian archipel-go, he supposes that the amount of pure gold may have been about ,000 kilograms, worth about £3,312,000.

Birkmyre places the amount of pure gold produced in America in 01 at 46,331 pounds troy; in Europe and Northern Asia, (exclusive of ina and Japan,) 4,916 pounds; total 51,247 pounds, equal to 55,910 unds of British standard gold, and valued at £2,612,200.

It will thus be seen that these authorities concur in estimating the lue of the production of gold at the commencement of this century at out $13,000,000, in round numbers, and this is the sum which has en adopted in the tabular statements.

It will be observed, also, in the table given from Humboldt, that the pply was derived chiefly from South America and Mexico. Gold was st abundantly produced in New Granada, Brazil and Chili, and silver Mexico and Peru. The supply of silver at that period from America s about 800,000 kilograms, according to Humboldt, and in all, accordg to Chevalier, about 900,000 kilograms, valued at £7,965,000.

Phillips places it at 2,337,300 troy pounds, the value of which would approximately in round numbers $35,000,000. Of this amount 61 r cent. was obtained from Mexico.

RÉSUMÉ OF PRODUCTION TO 1803.

If, for the sake of presenting a connected view of the accumulation of e precious metals, we adopt the figures given by Jacob for the amount hand at the time of the discovery of America, and the revised estites of the statistics given by Humboldt, the result may be considered nearest approximation that can now be attained. The aggregate proction of Europe for the period from 1492 to 1803 is also to be added. re it may again be premised that we have to depend upon estimates her than on statistics. We are not, however, entirely in the dark in pect to the yield of the mines for at least a portion of the time.

McCulloch, estimating the dollar at 4*s*. 6*d*., makes the total of the table equal to £9,666,000, the total, including Europe and Asia, at £11,000,000 in round numbers.

The kilogram of fine gold, by the terms of the law 7 Germinal, year 11, is equal to 3,444 cs 44 centimes, (£138.) See Chevalier, p. 54.

Chevalier on Gold, Cobden's translation, pp. 54, 55.

Jacob, citing from Andre,[1] states that "the average product of the mines of Europe, including those of the Russian dominions in Asia, did not in the last 20 years of the 18th century amount to more gold than equal in value to £200,000, and silver equal to £600,000. Of this gold, more than one-half was yielded by the mines of Russia, which afforded none before the year 1704. Of the remainder, the greater portion was extracted from the Austrian dominions, and the remainder in various small quantities from Saxony, Prussia and Hanover." The *annual* production, during that period, was nearly as follows:

Russia	£150,000
Austria	200,000
Saxony	100,000
Prussia and Hanover	110,000
Other sources	40,000
Total	$600,000

It is observed that the mines of Germany, with the exception of those of Saxony, were very little worked or known until the end of the period from 800 to 1500, and that the time of the greatest yield was but a few years before the termination of that period, so that if the average annual quantity produced between 800 and 1500 be estimated at one-seventh or one-eighth of the average between 1780 and 1800, it cannot be far from the truth. If we accept £600,000 as the yield for the last 23 years of the period following the discovery, and assume an annual average of £100,000 for the remainder, we have a total of £42,500,000, or, in round numbers, $212,500,000, as the sum to be credited to Europe in the succeeding summary, no allowance being made for loss, or for the production of India, China, Japan and Central Asia.

Approximate production from 1492 *to* 1803.

North and South America	$5,608,194,000
Europe	212,500,000
Total	$5,820,694,000

PERIOD FROM 1803 TO 1848.

The production of gold remained nearly constant from year to year after 1800 until the mines of Russia and Siberia began to be more extensively worked from 1810 onwards. The production of silver had been increasing, but about this time (1809) the revolution commenced in Mexico, and the production of the mines was greatly diminished. Jacob estimates that it was lessened one-half, but this is considered by some as an exaggeration.

Danson, in the elaborate memoir before referred to, has carefully

[1] C. C. Andre, Neueste Zahlenstatistik, &c., Stuttgart, 1823. Jacob, i, 359.

ıvestigated the statistical returns from both North and South America ır this period of 45 years. He considers the most authentic existing ıaterials to be the collection of returns elicited from British consuls ɔsident in the mining countries of America, in reply to a circular issued y the minister of foreign affairs in 1830.[1] Reference is also made to ıe work of Duport.[2] The statistical tables which he presents of the roduction of the different countries have been referred to, and some of ıem given in the preceding pages of this report, as, for example, under lexico, page 156. The general summary of these tables is given as ıllows:[3]

Both Americas; general summary of production 1804–'48.

	Silver.	Gold.
exico	$702, 026, 872	$84, 920, 225
eru	216, 485, 527	31, 566, 898
uenos Ayres	287, 143, 190	170, 691, 290
hili[4]	38, 555, 205	99, 963, 316
olumbia	170, 000	204, 255, 328
razil		95, 000, 000
entral America		9, 000, 000
nited States		15, 500, 0. 0
Total, dollars	$1, 244, 380, 794	$710, 897, 057
Pounds sterling, at 4s. 2d	£259, 245, 995	£148, 103, 550

This gives a total value for the two metals of $1,955,277,581; in round ıumbers $1,955,000,000.[5]

There are no similar complete statistical summaries of the production ɔf the precious metals in Europe and Asia during this period. The bulk ɔf the product was, however, obtained from the Russian gold field, the ield of which increased rapidly from 1825 to 1848. (See pages 92, 93.) From the data there given the total value of the production from 1800 to 1848 may be set down at $200,000,000, in round numbers.

For the production of the European mines for the period of 45 years, 1803 to 1848,) I have been unable, after prolonged examination of uthorities, to arrive at any very satisfactory conclusion. Hypothesis eems to have taken the place of statistics, and even the estimates which

[1] These returns were made public in two sets, one in 1832, Parliamentary Papers, No. 338, and the other in 1843, Parliamentary Papers, No. 476 of those years.

[2] De la production des Metaux precieux au Mexique, &c., par St. Clair Duport. 8vo., Paris, 1843.

[3] Danson, 1857, Jour. Stat. Soc. Lon., xiv, 43.

[4] Commissioner Wilson, in his report for the year 1867, calls attention to an error in Mr. Danson's tabular statement for Chili. It is stated that about $30,000,000 which should have been added to the silver product was inadvertently added to the gold; thus the figures for the gold should be $70,757,532, and for silver, $56,525,000.

[5] Mr. Danson supposes that of this amount £360,579,545 was sent to Europe. Adding £1,122,997,475, the quantity sent to Europe from 1492 to the end of 1803, and we have a total of £1,483,577,020.

have been made are so combined with the estimates and returns of the production of Russia, Asia, and America that it is impossible to separate them in a satisfactory manner.

Humboldt, as already shown, estimated the value of the annual produce of the European mines of Hungary, Saxony, and those of northern Asia, at the commencement of this century, at £1,000,000. By subtracting the produce of Russia from this total the remainder should represent, approximately, the production of Europe at that time. Taking for the Russian production the average of 392 kilograms, (*vide* page 92,) value £54,096, the result is £945,904; in dollars, at $5 to the pound, $4,729,520. This result accords closely with the following calculation for another period, 1810 to 1830:

Jacob says that a communication from Baron Humboldt to Poggendorf's Annalen, shows that "the annual produce of the precious metals in Europe and Asiatic Russia amounts to 25,500 marcs of gold and 292,000 marcs of silver, of which 76,500 of silver and 22,000 of gold were from the Russian empire. The value of this gold is about £720,000, and of the silver £530,000, being together £1,250,000 annually, or in the period of 20 years, from 1810 to 1829, £23,000,000."[1] [£25,000,000.] If from this total as corrected, in round numbers $125,000,000, we subtract the production of Russia for the same period, viz, $31,000,000 in value in round numbers, we obtain the sum of $94,000,000, or an average of about $4,700,000 a year for the production of Europe. The figures given by Phillips for the production of silver and gold in 1800 show an aggregate value of $3,000,000, in round numbers.

Birkmyre's table of production of gold and silver in the years 1846 and 1850, (Appendix D, Table XIV,) shows a value of £1,309,600 for Europe in 1846, or in dollars, $6,548,000 in round numbers.

Considering the foregoing data, I have assumed that the average annual value of the production in Europe from 1800 to 1848, 47 years, was $7,000,000,[2] showing a total value of $329,000,000, and with the addition of the produce of Russia, $529,000,000.

The total production for this period, (1803 to 1848,) without any allowance being made for loss, or for the yield of China and India, may be summed up approximately as follows:

Aggregate production from 1803 *to* 1848.

North and South America	$1,955,000,000
Russia	200,000,000
Europe	329,000,000
Total	$2,484,000,000

[1] Jacob, ii, p. 268.

[2] This is considerably above the present production as shown by the later statistics.

PRODUCTION FROM 1848 TO 1868.

At the time of the discovery of gold in California in 1848, the aggregate annual production of the metal including a nominal estimate of $10,000,000 for Asia, was not over $40,000,000. The rapid increase in the production from that time is well known. Three years later the Australian placers contributed to swell the amount, until in 1853 the aggregate annual production of gold reached its maximum, and was no less than $193,500,000 in value, as shown in the annexed tabular statement. From that time to the present the production has been steadily decreasing, although maintained in part by the discovery of one new region after another.

Production of gold and silver in 1853.

Country.	Gold.	Silver.	Total.
California and other portions of the United States[1]	$61,000,000	.....	$61,000,000
Australia[2]	60,000,000	.....	60,000,000
Russia and Siberia[3]	15,000,000	$700,000	15,700,000
Mexico and South America[4]	8,000,000	29,000,000	37,000,000
Europe,[5] (estimated)	1,500,000	7,300,000	8,800,000
Africa, (estimated)	1,000,000	.....	1,000,000
Borneo and East Indies[6]	5,000,000	.....	5,000,000
Japan and Central Asia[7]	5,000,000	.....	5,000,000
Total	156,500,000	37,000,000	193,500,000

The production of silver may be considered to have been pretty uniformly maintained until the year 1860–'61, when the great Comstock lode and the other silver regions of Nevada were discovered. Since that time the annual production of silver has been increasing, and may now be valued at about $54,000,000, as shown in succeeding tabular statement.

This table shows approximately the production at the present time in the principal gold and silver regions of the globe. The statistics of the gold production have already been given on page 108, at the end of the section upon gold, but the totals are here repeated for convenience of reference and comparison with the silver production.

[1] I have here followed the returns for California for 1853, as given on page 20, viz., $54,965,000, in round numbers $55,000,000, and have added 10 per cent. The table given by Commissioner Browne makes the product for 1853, $57,330,000. Ten per cent. added to this would give a total of over $63,000,000. To the sum for California, $500,000 is added for other portions of the United States not there included.

[2] Ounces, 3,150,020, (page 80,) at $19 04 per ounce = $59,976,380, in round numbers $60,000,000. The table given by R. Brough Smyth, 1866, gives 2,676,345 ounces as the export for 1853; but some additions were to be made for a portion exported through New South Wales and other colonies.

[3] See pages 92 and 93 for gold and page 182 for silver.

[4] The silver production of South America is here estimated at $10,000,000, and for Mexico, $19,000,000.

[5] An estimate based on the returns on pages 177, 179, 181, 185 and other data.

[6] and [7] For these countries I have made a merely nominal estimate of $10,000,000 as the aggregate; it is probably far below the actual production. Of the production of silver little or nothing is known.

Approximate statement of the value of the production of gold and silver in the principal gold and silver producing countries, 1867.

SOURCE OF PRODUCTION.	GOLD.		SILVER.		GOLD AND SILVER.	
	Value of product.	Ratio per cent.	Value of product.	Ratio per cent.	Total value of production.	Ratio per ct.
United States:						
California	$25,000,000	.....	.....	.....	$25,000,000	.....
Nevada	6,000,000	.....	$12,500,000	.....	18,500,000	.....
Oregon and Washington	3,000,000	.....	.....	.....	3,000,000	.....
Idaho	5,000,000	.....	2,500,000	.....	7,500,000	.....
Montana	12,000,000	.....	.....	.....	12,000,000	.....
Arizona	500,000	.....	.....	.....	500,000	.....
New Mexico	300,000	.....	.....	.....	300,000	.....
Colorado	2,000,000	.....	500,000	.....	2,500,000	.....
Utah, Appalachians, and other sources (estimate)	2,700,000	.....	.....	.....	2,700,000	.....
Total	56,500,000	43.23	15,500,000	28.70	72,000,000	39.02
British possessions	2,560,000	1.96	.....	.....	2,560,000	1.39
Mexico	1,000,000	.76	19,000,000	35.30	20,000,000	10.84
Central and South America	5,300,000	4.05	10,000,000	18.59	15,300,000	8.30
Australia	31,550,000	24.14	20,000	.04	31,570,000	17.11
New Zealand	6,000,000	4.59	.....	.....	6,000,000	3.26
Russia	15,500,000	11.87	700,000	1.30	16,200,000	8.77
Europe	1,370,000	1.06	8,600,000	15.97	9,970,000	5.40
Africa	900,000	.68	.....	.....	10,900,000	5.91
Borneo and East Indies	5,000,000	3.83				
China, Japan, and Central Asia	5,000,000	3.83				
Total	$130,680,000	100	$53,820,000	100	$184,500,000	100

The figures are given in round numbers, and are drawn from the statistics presented in detail in the preceding chapters, or are estimates based upon the latest statistics and information that could be obtained. The amount of production for each country is stated by value in dollars, not by weight, for nearly all the returns of production of North and South America are made by value.

No effort has been made to isolate the value of the silver contained in the native gold of California and other gold regions. From the fact that the returns of gold bullion are made by value, this is not essential.[1]

It will be observed that in stating the value of the silver product of Nevada $6,000,000, or about one-third of the total bullion yield, is considered to be gold. The figures are the same as are given on page 57 with the exception of those for Idaho. Later information from that Territory has authorized the conclusion that the silver product for 1867 was nearer

[1] From the returns of the director of the United States mint and branches, it appears that from 1841 to 1868, the amount of silver parted from gold of domestic production was $5,261,776.

$2,500,000 in value than $1,500,000. Of the aggregate of $56,500,000 now credited to the United States as gold bullion it is probable that from $500,000 to $1,000,000 should be entered under the head of silver, thus increasing the total of silver from $14,500,000 to $15,000,000 or $15,500,000, and diminishing the total for gold to an equal amount. As it was not possible to ascertain what portion of this estimated additional amount for silver should be credited to California, Montana, New Mexico, Utah, and other sources, the separation from the figures for the gold product has not been attempted.

The ratio of the value in each of the principal countries to the value of the total production is shown in separate columns.

It appears that the total annual production of gold and silver at the present time is approximately as follows:

Gold	$130,680,000	70.83 per cent.
Silver	53,820,000	29.17 per cent.
Total	$184,500,000	100 per cent.

Of this total, 39.02 per cent. is produced within the limits of the United States; and of the gold, California and the other gold-producing regions of the country furnished 43.23 per cent.; Australia, 24.14 per cent.; and Russia, 11.87 per cent.[1]

At the commencement of this century the total gold production exclusive of Asia was less than $13,000,000; in 1847 it was about $41,000,000; and in 1853, $156,500,000.

Of the present production of silver the United States supplies about 29 per cent.; Mexico, 35.

The production of silver in the great silver region of the United States may be regarded as only commenced. Most of the silver has hitherto been taken from the Comstock lode, but when by means of railroads the other rich silver districts of Nevada are made more accessible for machinery, supplies, and labor, the total product of the State will be greatly increased, and, together with the opening of the many veins of Idaho, Arizona, Utah, and California, the product of silver bullion will probably soon equal if it does not exceed that of Mexico at any period of its history.

The total annual silver product of the world at the commencement of this century was about $36,000,000 in value, and as the gold product at that time was about $13,000,000, the ratio of the production of the two metals was as 36 to 13, being the reverse of the existing ratio, as will be seen by the following comparison, in per cents, of the total production at the two periods:[2]

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[1] In summing up the percentages on page 108, the fractions were not correctly given. A slight change was made in the table in the proof, and the changes required in the fractions in the text were overlooked.

[2] Some details upon the relative values of gold and silver at different periods will be found at the end of the report.

Ratio of the production of silver and gold.

	1800.		1867.	
	Amount.	Per cent.	Amount.	Per cent.
Silver	$36,000,000	73.47	$53,820,000	29.17
Gold	13,000,000	26.53	130,680,000	70.83
Total	$49,000,000	100	$184,500,000	100

The diagram which accompanies this report will assist in making the gradual change in the product of gold and silver more evident. The profile line which shows the production of gold exhibits in a striking manner the rapid increase of the production up to 1854, and its present rapid decline.

AGGREGATE PRODUCTION TO 1868.

Having now shown as far as possible the annual production in 1848, in 1853, and in 1867, of both gold and silver, the calculations of the total accumulation of the precious metals up to the present time may be resumed.

Before giving the tabular statement which has been prepared, the following estimates by Mr. Newmarch, embodied by him in a letter to the French commission,[1] are presented together with an abstract of his observations in explanation.

He says that it is impossible to give exact figures, but he was disposed to regard the statement as the nearest approximation to the truth that could be reached.

Total mean annual production of gold and silver during the fifteen years from 1849 *to* 1863. *Table in millions of pounds sterling,* (13,5=£13,500,000.)

Number of years.	Period of production.	Gold annually produced.			Silver annually produced.	Total amount of gold.		Total of silver.
		Old sources.	New sources.	Total.		Old sources.	New sources.	
3	1849 to 1851	£13.5	£10.3	£23.9	£15.5	£40.5	£30.9	£46.5
5	1852 to 1856	14.0	24.7	38.7	16.1	70.0	123.5	80.5
3	1857 to 1859	14.6	21.9	36.5	17.1	43.8	65.7	51.3
4	1860 to 1863	15.3	18.3	33.5	18.2	61.2	73.2	72.8
15	Totals	.....	.....	.....	.....	215.5	293.3	251.1
	Averages	14,3	19.5	33.8	16.7	.....	.....	.....

[1] In volume 5 of "Enquête sur les principes et les faits généraux qui régissent la circulation monétaire et fiduciaire," p. 538.

According to these figures the quantity of gold produced annually since 1856 from new sources has diminished nearly 13 per cent., and the quantity of silver has increased nearly 12 per cent. He estimated that the total quantity of gold from the modern sources was distributed approximately as follows:

	Sterling.	
Great Britain	£60,000,000	
France	110,000,000	
United States	50,000,000	
		£220,000,000
Australia	30,000,000	
California	20,000,000	
Turkey and the East	40,000,000	
Brazil, Egypt, Spain, &c	40,000,000	
		130,000,000
Total		£350,000,000

A summary of the statistics which I have collected, and the estimates which I have made upon the total production in the 20 years, from 1848 to 1868, inclusive, are given in the annexed table. The figures have been drawn as far as possible from the returns printed in the foregoing pages, and where estimates have been made they are based on actual returns for certain years or periods, and explanations are given in the foot-notes attached to the table. The returns from the principal gold-producing countries, California and Australia, are very complete and satisfactory, compared with those from Europe, with the exception of Russia. It is extremely difficult to obtain connected statistics of the production of Spain, Italy, Saxony, and Austria.[1] The figures must be received as approximations, as nearly correct as it is possible to obtain them. They show a total for the 20 years of—

Gold	$2,757,600,000
Silver	813,400,000
Total	$3,571,000,000

[1] It may here be observed in explanation of the absence of many statistics that should have appeared in these pages in order to render the work as complete as the author desires, that the time originally allowed for the preparation of the report (three months) was not sufficient to permit many important official publications to be obtained or consulted.

Approximate statement of the aggregate production of the precious metals, from 1848 *to* 1868.

COUNTRY.	GOLD.			SILVER.		
	Value of production.	Totals.	Per ct.	Value of production.	Totals.	Per ct.
NORTH AMERICA.						
California & ne'boring States[1]	$861, 550, 000			$10, 000, 000		
Montana[2]	71, 500, 000			500, 000		
Colorado[3]	29, 500, 000			500, 000		
New Mexico and Appalachians[4]	9, 000, 000			1, 000, 000		
Nevada[5]	28, 450, 000			61, 000, 000		
		$1,000,000,000	36. 26		$73, 000, 000	8.97
British Columbia	20, 000, 000					
Nova Scotia	2, 500, 000					
Canada	100, 000					
		22,600,000	.82			
Mexico		20,000,000	.72		380, 000, 000	46.71
SOUTH AMERICA.						
Chili	12, 000, 000			70, 000, 000		
Peru	10, 000, 000			70, 000, 000		
Bolivia	6, 000, 000			50, 000, 000		
Brazil	30, 000, 000			1, 000, 000		
New Granada	30, 000, 000			4, 000, 000		
Central America	4. 000, 000			5, 000, 000		
		92,000,000	3. 33		200, 000, 000	24. 59
AUSTRALIA.						
Victoria	760, 000, 000			90, 000		
New South Wales	85, 000, 000					
South Australia and Tasmania, Queensland	3, 000, 000					
		848,000,000	30. 75		20, 000	.02
New Zealand		48,000,000	1. 75			
RUSSIA AND EUROPE.						
Russia[6] and Siberia	308, 000, 000			14, 000, 000		
Austria	16, 000, 000			44, 000, 000		
Norway				5, 000, 000		
Spain and rest of Europe	3, 000, 000			97, 380, 000		
		327, 000, 000	11. 86		160, 380, 000	19.73
Africa	200, 000, 000					
Asia	200, 000, 000					
		400, 000, 000	14. 51			
Totals		$2,757,600,000	100		$813, 400, 000	100

[1] From the sum total of California and the Pacific States, viz: $961,000,000, (p. 21,) I have deducted the total bullion product of Nevada, viz: $89,450,000—gold, $28,450,000; silver, $61,000,000, and have also deducted an estimated amount of $9,000,000 for Idaho silver, and $1,000,000 to cover silver produced in California, Arizona, and elsewhere.

[2] For Montana I have followed the estimate given by W. S. Keyes. (See p. 40.) Deducting $100,000, and regarding $500,000 of the amount as silver.

[3] Colorado. This is in part an estimate. (See p. 46.) Of the total of $30,000,000, $500,000 has been regarded as silver.

[4] New Mexico, Appalachians, and other sources. It is difficult to ascertain the amount of gold produced in the southern States; but this is an estimate based on the mint returns. A small amount of silver has been extracted from argentiferous lead and from the copper veins of Lake Superior. From this last source $309,970 in value was deposited in the mint up to June, 1868.

[5] Nevada. This amount includes the gold contained in Comstock bullion, with a nominal addition for other sources.

[6] To the total production, according to the table (p. 93) for 1848 to 1864, an estimated amount of $51,340,368 is added for the four years 1865, this being based on the annual average of $15,335,088. (See p. 93.)

Summary of aggregate production of gold and silver up to 1868.

14 to 800, (amount supposed to be on hand)	$1,790,000,000
800 to 1492	345,000,000
1492 to 1803	5,820,700,000
1803 to 1848, (p. 210)	2,484,000,000
1848 to 1868	3,571,000,000
Grand total	$14,010,700,000

This total, as already explained, is at best only an approximation, and is exclusive of the production of Asia, except a nominal allowance of $10,000,000 per annum for the last 20 years, and, with one or two exceptions, is without any allowance for loss in transportation or by wearing.

The first item includes what was supposed to be on hand in the time of Augustus (*vide* pages 201 and 204) and does not include any allowance for the production during the period, of which, in reality, nothing definite or satisfactory is known.

CHAPTER IX.

CONSUMPTION AND MOVEMENT OF THE PRECIOUS METALS.

ESTIMATE OF THE AMOUNT OF GOLD AND SILVER IN CIRCULATION IN VARIOUS COUNTRIES—ESTIMATES OF THE AMOUNT OF GOLD AND SILVER IN THE UNITED STATES AT DIFFERENT PERIODS—COINAGE OF ENGLAND, FRANCE, AND OTHER COUNTRIES—COINAGE OF THE UNITED STATES—USE IN THE ARTS AND LOSS BY WEARING—CURRENT OF THE PRECIOUS METALS—EXPORTATION TO INDIA—DECREASE IN THE PRODUCTION OF GOLD—PRODUCTION OF GOLD FROM PLACERS AND FROM VEINS COMPARED—PROBABLE RISE IN THE VALUE OF GOLD—MEANS OF PROMOTING THE PRODUCTION OF THE PRECIOUS METALS—ENCOURAGEMENT OF VEIN MINING—GOVERNMENT PROTECTION AND LEGISLATION REQUIRED—IMPORTANCE OF A NATIONAL MINING COLLEGE—ORGANIZATION OF A CORPS OF MINING ENGINEERS SUGGESTED.

USE OF THE PRECIOUS METALS FOR MONEY.

The inquiry now naturally arises, what use is made of this enormous amount of gold and silver? In what forms, and where, does it now exist? The chief use of these metals is for money—representing labor or property; next in the arts, in the form of plate, ornaments, and other objects. It would be exceedingly interesting to ascertain the total amount of gold and silver in both of these forms now in existence, in order to compare it with the amount produced. This, however, is practically impossible. The difficulties which surround such an inquiry are almost as great as those which surround the question of production. It is an inquiry which cannot be entered upon here to the extent which its importance deserves, but the few facts which have been brought together will serve to throw some light upon the subject.

During the general recoinage in England in 1774, the old and defective gold coins that were brought to the mint to be recoined produced £16,598,266 in new coins; £2,898,491 in value of new coin was also produced from ingots of foreign gold. It was supposed that there remained in circulation at the same time, within the kingdom, £5,000,000 in value of old guineas and half-guineas. The total of these sums is £25,447,002, which is supposed to have been the amount in circulation in England directly after the recoinage.

Lord Liverpool, in his letter to the King in 1805, from which the foregoing facts are derived,[1] estimates the amount of gold coin then in existence "in his Majesty's dominions" at over £30,000,000 in nominal value, and of silver coins about £3,960,435. It is also stated that M. Necker, in his treatise on the administration of the finances of France, estimated the quantity of specie circulating in that country at about £91,666,666, chiefly in silver.[2]

[1] *Vide* Lord Liverpool's Treatise on the Coins of the Realm, 4to, 1805, p. 176. [2] Ibid., p. 180.

Tooke, in his History of Prices,[1] has shown that even so early as 1560 the probable quantity of gold and silver coin in circulation in England and Wales was £1,100,000. In 1688, Gregory King's estimate of the gold coins in England and Wales was £3,000,000 of silver and £8,500,000 of gold. Mr. Morrison was led to believe that the amount of gold coin in 1780 was not less than £26,000,000. Sir George Rose estimated that it was £40,000,000 in 1798.

The following are Tooke's estimates of the quantity of British gold in circulation in the United Kingdom at the close of 1844 and at the close of 1866:

Estimate at the close of 1844		£36,000,000
Add for efflux from the Bank of England, 1845–'49	£15,000,000	
" " " " 1850–'54	35,000,000	
" " " " 1855–'56	14,000,000	
	64,000,000	
Less gold cancelled	6,000,000	
		58,000,000
		£94,000,000

He was, however, inclined to think that the amount of gold coin in circulation in 1844 was considerably more than the £36,000,000 assumed. On the assumption that it was £46,000,000—and he was inclined to adopt that amount as highly probable—he arrived at the following assumed gold circulation at the close of 1856:

Assumed gold circulation at close of 1844		£46,000,000
Add for efflux, 1845–'49		15,000,000
		61,000,000
Add for efflux, 1850–'56	£49,000,000	
Less exports to Australia	25,000,000	
		24,000,0000
Apparent gold circulation at the close of 1859		£85,000,000

He observes further, that considering the general tenor of former estimates of the quantity of gold coin in circulation in the United Kingdom, it does not appear that a supposition of even £75,000,000 sterling as the quantity at the close of 1866 would be unduly exaggerated.

Professor Jevons, in a recent communication to the Statistical Society of London, estimates the gold in circulation in Great Britain at £80,000,000, the silver at £14,000,000, and the bullion in bank at £15,000,000 more, making £109,000,000 in all.

McCulloch, in 1858,[2] says that the gold and silver employed in Great

[1] History of Prices, vi, 701 and 702. [2] Encyclopedia Britannica, xviii, 465.

Britain as currency, and in the customary reserves in the banks, was supposed to amount to from £70,000,000 to £75,000,000, and in France to £130,000,000 or £140,000,000. He estimated the entire sum in use as money in Europe, North and South America, Australia, Cape of Good Hope and Algeria, at from £490,000,000 to £510,000,000, or a mean of £500,000,000—in round numbers $2,500,000,000.

In regard to the metallic circulation of France there is a wide difference in the estimates. Chevalier estimated it at 2,500,000,000 francs, about $500,000,000. Roswag,[1] who has examined the subject with great care, estimates that the stock in 1865 did not exceed 3,000,000,000 francs, or $600,000,000. Mr. George Walker adds $100,000,000 to this estimate of Roswag, and considers $700,000,000 as fairly representing the total circulation of France.

The value of the precious metals circulating in Russia in the early part of 1851 was estimated at 326,000,000 of roubles—about $269,000,000,

The amount of coin in circulation in India in 1860 was estimated at £100,000,000 by Mr. Wilson. Of the amount in China we have no means of making even an approximate estimate, but it is known to be very large and to consist in a great part of Mexican dollars and silver bullion.

The amount of gold and silver in circulation and in the treasury and banks of the United States at the present time is supposed to be about $200,000,000.

In 1861 the amount was estimated by Secretary Chase at $275,000,000.

In the report of Secretary Guthrie for 1854,[1] a tabular statement is given of the estimated amounts of gold and silver in the United States at different periods. This table is appended.

Estimates of the amount of gold and silver in the United States at different periods.

Year.	Specie in circulation.	Specie in the banks.	Total in the country.	Authorities.
	Millions.	*Millions.*	*Millions.*	
1816	$7½	$15 to 19	$22½ to 26	Crawford and Gallatin.
1819	8	29	37	Crawford.
1819	.....	15½	.....	Congressional report.
1820	.....	19½	.....	Gallatin.
1829	8½	22½	31½	Woodbury.
1830	10	22	32	Gallatin.
1830	8	15	23	Sanford.
1833	12	30½	42½	Congressional report.
1833	4	25	29	Taney.
1836	25	40	65	Woodbury.

[1] The author regrets that during the preparation of this report he has not had an opportunity of consulting the important work of M. Roswag. It is now cited from the letter of Mr. George Walker to the Hon. David Ames Wells, special commissioner of the revenue, Appendix B, of the commissioner's report for 1868.

[2] Senate document, second session, 33d Congress, volume 4, 1854-'55, page 280.

Estimate of the amount of gold and silver in the United States, &c.—Continued.

Year.	Specie in circulation.	Specie in the banks.	Total in the country.	Authorities.
	Millions.	*Millions.*	*Millions.*	
1837	35	38	73	Woodbury.
1838	52½	35	87½	Do.
1839	42	45	87	Hazard, (Commercial Register.)
1840	50	33	83	Woodbury.
1841	35 to 45	35	70 to 80	Gouge, (Journal of Banking.)
1844	50	50	100	Hunt, (Merchant's Magazine.)
1845	52	44	96	Bank returns and estimates.
1846	55	42	97	Do.
1847	85	35	120	Bank returns and estimates. (Constitutional treasury began to operate.)
1848	66	46	112	Bank returns and estimates.
1849	77	43	120	Do.
1850	109	45	154	Do.
1851	138	48	186	Do.
1852	.....	.....	204	Estimates.
1853	.....	.....	236	Do.
1854	181	60	241	Bank returns and estimates.

STATISTICS OF COINAGE.

The statistics of coinage in different countries, although they cannot be taken as accurately representing the amount of the precious metals in circulation, are important in this connection.

Chevalier says:[1] "During the government of Napoleon I, the coinage of gold amounted to 527,000,000 francs, or an average of 48,000,000 per annum. Under Louis XVIII it was a smaller proportion, amounting to a total of 389,000,000 francs, or an average of 39,000,000 per annum. Under Charles X a great decline is observable; for during the whole reign the gold coinage amounted to only 52,000,000 francs. During the 17 years of Louis Philippe's reign gold was only coined to the amount 215,000,000 francs, or 12,500,000 annually. The ascending reaction began to manifest itself in 1848, for in the general distress caused by the revolution of that year many persons carried their gold plate to the mint to be converted into money; but the influence of the new mines is not perceptible till after 1850. During the period of eight years, ending December 31, 1857, the gold coined at the Paris mint amounted to two 2,750,000,000 francs, or an average of 343,000,000 yearly. During the period of 45 years, comprised between the seventh *Germinal*, year 11, and January 1, 1848, it had only been one 1,186,000,000, or 22,300,000 francs per annum. The greatest amount coined in one year was in 1857, when it reached 572,561,225 francs.

According to a late official statement of M. Pelouze, the total coinage of the French mint since 1795, the date of the establishment of the mon-

[1] On the probable fall in the value of gold, &c., &c., by Michel Chevalier. Translation by Cobden. Appleton's edition, p. 59.

etary system, up to the 1st of January, 1866, and the amount of decimal coinage officially withdrawn from the circulation in the same period, was as follows:

		Francs.
Gold coinage		6,572,113,570
Withdrawn from circulation		71,082,860
Difference		6,501,030,710
Silver coinage	4,673,156,456	
Amount withdrawn	66,280,101	
Difference		4,606,875,355
Total of gold and silver		11,107,907,065

Statement of the different kinds of gold and silver coin made according to the decimal system in France, from 1705 *to December* 31, 1865.

GOLD.

Denominations.	100 francs.	50 francs.	40 francs.	20 francs.	10 francs.	5 francs.	Total.
	Francs.	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*
Amount coined	36, 837, 300	41, 839, 300	204, 432, 360	5, 231, 002, 360	866, 758, 080	191, 244, 170	6, 572, 113, 570
Deducting the pieces withdrawn from circulation					48, 589, 920	22, 492, 940	71, 082, 860
There remains in circulation	36, 837, 300	41, 839, 300	204, 432, 360	5, 231, 002, 360	818, 168, 160	168, 751, 230	6, 501, 030, 710

SILVER.

Denominations.	5 francs.	2 francs.	1 franc.	50 centimes.	25 centimes.	20 centimes.	Total.
	Francs.	*Francs.*	*Francs.*	*Francs.*	*Francs. Cent.*	*Francs. Cent.*	*Francs. Cent.*
Amount coined	4, 435, 139, 860	72, 972, 442	90, 572, 350	60, 964, 943	7, 671, 101 25	5, 835. 769 40	4, 673, 156, 456 65
Deducting the pieces withdrawn from circulation [1]	52, 373, 700			4, 979, 085	7, 671, 101 25	1, 256, 215 00	66, 280, 101 25
There remains in circulation	4, 382, 766, 160	72, 972, 442	90, 572, 350	55, 985, 845		4, 579, 554 40	4, 606, 876, 355 40

[1] Pieces remelted for China ..... francs.. 15, 000, 000
Pieces remelted to make one-franc pieces and fifty-centime pieces, before the law of the 25th of May, 1864 ..... do.... 28, 199, 000
Pieces remelted by virtue of the law of the 25th of May, 1864 ..... do.... 9, 174, 700

Sum total, francs 52, 373, 700

The records of the British mint show that in the 23 years from 1843 to 1865, inclusive, gold was coined to the amount of £120,689,928, and silver to the amount of £7,449,499, making in all £128,139,427, as shown in the following table:[1]

Coinage of gold and silver at the British mint, 1843 to 1865.

Years.	Gold and silver coined at the mint.		Light coin withdrawn from circulation.	
	Gold.	Silver.	Gold.	Silver.
1843	£6, 607, 849	£239, 580	£2, 559, 893	£107, 000
1844	3, 563, 949	610, 632	3, 314, 122	56, 000
1845	4, 244, 608	647, 658	718, 075	23, 900
1846	4, 334, 911	559, 548	609, 143	18, 000
1847	5, 158, 439	125, 730	660, 477	14, 500
1848	2, 451, 999	35, 442	800, 820	54, 750
1849	2, 177, 955	119, 592	611, 139	135, 100
1850	1, 491, 836	129, 096	465, 633	150, 000
1851	4, 400, 411	87, 868	641, 636	100, 000
1852	8, 742, 270	189, 597	430, 608	48, 200
1853	11, 952, 391	701, 545	403, 786	22, 000
1854	4, 152, 183	104, 480	474, 766	16, 000
1855	9, 008, 663	195, 510	379, 563	63, 000
1856	6, 002, 114	462, 528	419, 121	74, 000
1857	4, 859, 860	373, 230	511, 000	92, 568
1858	1, 231, 023	445, 896	393, 000	67, 500
1859	2, 649, 509	647, 064	334, 000	60, 000
1860	3, 121, 708	218, 403	374, 000	113, 000
1861	8, 190, 170	209, 484	581, 000	97, 600
1862	7, 836, 413	148, 518	618, 000	135, 000
1863	6, 607, 456	161, 172	482, 000	102, 800
1864	9, 535, 597	535, 194	456, 000	123, 500
1865	2, 367, 614	501, 732	645, 000	93, 000
	£120, 689, 928	£7, 449, 499	£16, 882, 790	£1, 767, 418

Amount of gold and silver coined at the mint between 1843 and 1865	£128, 139, 427
Amount of light gold and silver coin withdrawn from circulation during the same period	18, 650, 208
	£109, 489, 219

Showing an average addition of £4,760,400 a year to the stock of coin in the country, which would not be needed if small notes were allowed to be issued.

This table also shows the amount of light gold and silver coin withdrawn from circulation during the same period, £18,650,208. This amount deducted from that of the new coins shows a difference of £109,489,219 added to the metallic currency of that country in 23 years.

The average gold coinage of England slightly exceeds £5,000,000 a year. The average cost of coining a sovereign, including all the mint

[1] From "The Science of Finance," by R. H. Patterson—Edinburgh and London, 1868—pages 43 and 679.

expenses, is found to be 0.72 penny, and the estimated expense of recoining 50,000,000 of sovereigns is £279,975. The cost per sovereign, taking the actual expenses during 11 weeks, when 5,663,656 pieces were coined, was found to be 0.311*d.* per piece, or $\frac{13}{100}$ of 1 per cent. of the value of the gold.[1]

Statistics of coinage of the United States, Great Britain and France, were presented by Mr. S. B. Ruggles in his written argument in favor of a 25-franc coin submitted at the sixth sitting of the International Monetary Conference held during the progress of the Exposition, and they are here given:

I. The gold coinage of the United States in the 57 years from 1792 to 1849, next preceding the outburst of gold in Californiain 1849, was	$85,588,038
In the next two years, 1849 and 1850	94,596,230
In the next 15 years, 1851 to 1866	665,352,323
Total	$845,536,591
II. The gold coinage of Great Britain in the 35 years from its reform, in 1816, to 1851, was £96,021,151, or	$480,105,755
In the 15 years from 1851 to 1866, £91,047,139, or	455,235,655
Total	$935,341,450
III. The gold coinage of France in 58 years, from 1793 to 1851, was, in francs, 1,622,462,580, or	$324,492,516
In the 15 years, under the empire of Napoleon III, from 1851 to 1866, in francs, 4,938,641,490, or	987,728,298
Total	$1,312,220,814

Summary.

Total coinage by the three nations before 1851:	
By the United States	$180,184,268
By Great Britain	480,105,755
By France	324,492,516
Amount	$984,782,639
From 1851 to 1866:	
By the United States	$665,352,323
By Great Britain	455,225,695
By France	987,728,298
Amount	$2,108,356,316

[1] From the testimony of Robert A. Hill, esq., assistant coiner of the royal mint.

In regard to the coinage of the United States, and other nations, Mr. Ruggles observes:

"The amount coined by the United States having been $845,536,591, if two-thirds shall be deducted for the portion recoined in Europe or used in the arts, the amount remaining which would require recoinage (for the purpose of unification) would not exceed, in round numbers, $300,000,000. It is true that a portion of the coin of the United States exported to Europe is sent without recoinage to Germany and other continental nations, for the use of their people emigrating to the United States. But if we allow $200 *per capita* (which, including women and children, would be a large estimate) for 150,000 emigrants, it would amount only to $30,000,000. In view, moreover, of our large importations of foreign merchandise, with our temporary disuse of gold for domestic purposes, even the estimate of $300,000,000 may be too large. The recoinage, however, of the whole amount would cost, at one-fifth of one per cent., (the rate ascertained by experience,) only $600,000."

Mr. Ruggles states that the amount of gold now in actual circulation in France, Belgium and Italy is estimated by M. de Parieu and other distinguished economists of Europe at 7,000,000,000 of francs, or $1,400,000,000, and that the amount in circulation in the residue of continental Europe would probably carry the total to $1,800,000,000. He further observes:

"The estimate of $1,400,000,000 as the gold circulation of France, Italy, and Belgium, will not be regarded as exaggerated when we consider the heavy drain of silver from France during the last 15 years, in connection with the fact that its silver coinage from 1795 to 1851 had amounted to 4,457,595,345 francs, or $891,519,069. Of this large amount, at least $750,000,000 are said to have been exported within the last 15 years, principally to the East Indies, leaving the amount of silver now in circulation in France not exceeding $150,000,000.

"The coinage of silver at the royal mint of Great Britain in the 10 years from 1857 to 1866, both inclusive, was only £3,677,182, or $18,385,910. The total coinage of silver in France during the reign of the present Emperor, in the 15 years from 1851 to 1866, was only 215,561,101 francs, or $43,112,180. The silver coinage of France, Great Britain, and the United States, from 1851 to 1866, was in round numbers only $117,000,000, against a gold coinage, in the same period, of $2,108,000,000.

"So severe, indeed, had become the destitution of small silver coin in 1865, that the treaty of the 23d of December, of that year, authorizing the issue of silver of denominations less than five francs, reduced its standard about 7 per cent., (from .900 fine to .835 fine,) to prevent its further disappearance. At the same time, it limited the amount to be coined in France to 239,000,000 francs, or $47,800,000.

"Fortunately for France and the commercial world, the surplus gold of the United States was at hand during these 15 years, ready to be recoined. Steadily filling the immense vacuum caused by this great export of silver, it now invigorates every branch of industry in France.

"The monetary movement in these 15 years on the waters of the globe signally illustrates the power of the oceans not to divide but to unite the continents in a common 'solidarity.' Subdued by steam to the use of man, they are now incessantly ministering to the wide-spread monetary necessities of the human race. It needs but a glimpse of their statistics to map out the great oceanic monetary currents. Within that brief period, only the dawn of the opening auriferous era, we discern a mass of gold, in the aggregate exceeding $500,000,000, moving across the Atlantic from the United States; another and still larger volume of $833,000,000 pouring out from Australia upon the surrounding oriental waters, and at least one-half finding its way to London over the Indian ocean, the Mediterranean, and the Atlantic; another golden mass of $620,000,000 crossing the British channel into France, while the great counter-current of $565,000,000 of silver, largely derived from France, is seen flowing out of England and up the Mediterranean on its way to the ever-absorbing East."

From the annexed summary exhibit of the coinage of the United States mint and its branches up to the close of the fiscal year ending June 30, 1868, it will be seen that the total coinage from the commencement is:

Gold	$909,516,715 67
Silver	130,507,493 62
Total of gold and silver	$1,040,024,209 29

Summary exhibit of the coinage of the mint and branches to the close of the fiscal year ending June 30, 1868.

Mints.	Commencement of coinage.	Gold coinage.	Silver coinage.	Copper coinage.	Entire coinage.	
		Value.	*Value.*	*Value.*	*Pieces.*	*Value.*
Philadelphia	1793	$441,904,670 50	$90,702,984 74	$9,128,548 55	1,033,853,686	$541,736,403 79
San Francisco	1854	250,474,656 81	6,983,937 17	.....	26,129,483	257,158,613 98
New Orleans, (Jan. 31, '61.)	1838	49,381,615 00	29,890,037 13	.....	94,890,695	70,271,652 13
Charlotte, (Mar. 31, '61.)	1838	5,048,641 50	.....	.....	1,206,954	5,048,641 50
Dahlonega, (Feb. 28, '61.)	1838	6,121,919 00	.....	.....	1,381,780	6,121,919 00
Assay Office, New York.	1854	163,901,963 17	3,230,514 58	.....	.....	167,132,477 75
Denver	1863	1,683,049 69	.....	.....	.....	1,683,049 69
Total	.....	909,516,715 67	130,507,493 62	9,128,548 55	1,157,462,598	1,049,152,757 84

Table V, in the appendix, shows in detail the amounts coined in each year, and the following gives the averages of coinage for each decade, 1793 to 1868, inclusive:

Recapitulation of averages of coinage for each decade from 1793 *to* 1868, *inclusive.*

Years.	Gold.	Silver.	Copper.	Total.
1793–1800, 8 years	$126,786 25	$180,056 84	$9,923 85	$316,766 94
1801–1810, 10 years	325,074 25	356,916 52	15,124 64	697,115 41
1811–1820, 10 years	316,651 00	597,081 09	19,115 86	932,847 95
1821–1830, 10 years	190,309 25	1 678,104 69	15,141 22	1,883,555 16
1831–1840, 10 years	1,879,186 20	2,719,977 90	34,232 22	4,633,396 32
1841–1850, 10 years	8,944,332 80	2,222,675 50	38,067 08	11,205,075 38
1851–1860, 9½ years	49,561,913 79	5,061,869 80	131,538 16	54,755,321 75
1861–1868, 8 years	40,138,587 46	1,778,964 82	822,840 62	42,740,392 90

USE IN THE ARTS, AND LOSS BY WEARING.

The estimates made by Jacob of the amount of the precious metals used in the arts have already been partly presented. He thought that it amounted in 1830 to about £5,900,00 a year. This is thought by many to be an under estimate. McCulloch thought that the value of gold and silver in Great Britian, in 1857, in the shape of plate, watches, jewels, and trinkets, might be safely estimated at £4 to each individual of the entire population, or a value in the aggregate of about £88,000,000, and adding £12,000,000 for Ireland, to £100,000,000. Extending the estimate to other countries, he concludes that in Europe, America, and Australia, the amount so used cannot be less than from £15,000,000 to £16,000,000 yearly. "But of this a portion, estimated at one-fifth or 20 per cent., is supposed to be obtained from the fusion of old plate, the burning of lace, picture frames, &c. And hence, if we duduct from the £15,000,000 used in the arts 20 per cent. for the old bullion, we have £12,000,000 for the total quantity of the supplies from the mines annually disposed of in this way, a considerable portion of which, including that used in the gilding of rooms, earthenware, books, harness, buttons, &c., cannot be again recovered or applied to any useful purpose."[1]

A very large amount of silver and gold is now annually consumed in electro-gilding and silvering of household plate, and trimmings of various kinds, but it should be noted that articles plated in this way have replaced to a considerable extent those of solid silver and gold, or at least that the manufacture of solid silver ware has not increased as it would if this art had not been discovered.

It is stated that one establishment in the United States—the Gorham Manufacturing Company—uses up 26 tons of silver annually, or 2,000 ounces a day, in the production of silver-ware and plate.

The amount of loss of the precious metals during transmission by sea and land and in circulation is difficult to ascertain with any precision,

[1] Ency. Brit. xviii, 466.

but it is an element which must enter into any calculation of the amount of these metals in existence. Considerable attention appears to have been given to this subject, but the investigations generally seem to have been very loosely conducted, and the results are altogether unsatisfactory as a guide for an estimate of the annual loss at the present time. The estimate by Jacob has already been explained, page 201. He assumed that the money in circulation, or rather the total stock of bullion, was diminished 10 per cent. in each period of 36 years, and upon this assumption he makes a total deduction of $188,000,000 for the period from 1492 to 1809.

In the years 1787 and 1798 experiments were made by the officers of the royal mint to ascertain the deficiency of weight of the various silver coins in use. In 1787 it was found that $12\frac{8}{10}$ crowns, or 27 half crowns, or $78\frac{1}{10}$ shillings, or $194\frac{6}{10}$ sixpences, were requisite to make up a pound troy, instead of $12\frac{4}{10}$ crowns, or $24\frac{8}{10}$ half crowns, or 62 shillings, or 124 sixpences, as issued from the mint.

In 1789 it was found that $12\frac{33}{40}$ crowns, or $27\frac{21}{40}$ half crowns, or $82\frac{9}{40}$ shillings, or $200\frac{37}{40}$ sixpences, were requisite to make up a pound troy, instead of $12\frac{8}{40}$ crowns, or $24\frac{32}{40}$ half crowns, or 62 shillings, or 124 sixpences, as issued from the mint.

Comparing the deficiency of weight of these several denominations of silver coins with their legal weight as issued from the mint, the loss amounts in the crowns to $3\frac{161}{513}$ per cent., in the half crowns to $9\frac{991}{1101}$ per cent., in the shillings to $24\frac{1964}{3289}$ per cent., in the sixpences to $38\frac{2294}{8037}$ per cent.

"It is singular that these several silver coins, particularly the shillings and sixpences, though in general they retain no remains of any impression, or any rough edges, which would make them subject to friction, appear to have diminished by use, in the short interval of eleven years, according to the experiments above mentioned, in the following proportions:[1] crowns, $\frac{100}{513}$ per cent.; half crowns, $1\frac{333}{367}$ per cent.; shillings, $5\frac{55}{3289}$ per cent.; sixpences, $3\frac{1189}{8037}$ per cent."

Woolhouse says that the wear and tear of the gold coinage is such that very nearly 3 per cent. of the whole circulation goes out annually, and the quantity which suffices to throw a sovereign out of circulation is $\frac{257}{1000}$ parts. McCulloch, taking into account the extraordinary extension of navigation and emigration, the risks of shipwreck and other accidents, estimated the loss, including wearing, at about $1\frac{1}{2}$ per cent. of the entire mass of the currency.

The testimony given before the royal commission on international coinage by J. Miller, of the weighing room of the bank of England, contains some valuable data upon the loss of weight of sovereigns by wear.[2] One thousand sovereigns, as issued from the mint, weighed, in parcels of 100 each, 25.68 ounces, or 256.80 in bulk, value at £3 17*s.* $10\frac{1}{2}d.$ per ounce, £999 18*s.* $2\frac{1}{2}d.$, or 20*s.* each; 3,000 sovereigns, as in circulation, weighed,

[1] Lord Liverpool's Treatise, pp. 187, 188. [2] Report, 1868, p. 94.

in parcels of 1,000 each, 255.87 ounces, 255.76 ounces, and 255.80 ounces, or an average of 19*s.* 11*d.* each.

The wear of coins is chiefly upon the small coins in active circulation for retail trade. The balances of larger transactions are liquidated by notes and checks without the movement of specie. In England not more than 5 per cent. of banking transactions, amounting in 1866 to £4,588,000,000 sterling, are in notes and coin, and but little more than one-half of 1 per cent. in coin.[1]

The clearing-house system, in addition to its other great advantages, is a great economizer of wear and tear of the precious metals. The enormous transactions in gold, at the present time, in New York do not involve the movement of the metal. The balances are liquidated by checks and gold certificates.

The following remarks upon the importance of maintaining coin in good condition are extracted from the report of the Director of the United States mint for 1867:

MAINTENANCE OF COIN IN GOOD CONDITION.

"There is a subject which, I believe, has not been brought to the attention of the law-making power, and the present seems to be a proper opportunity. If it is the duty of government to keep the paper currency in good repair, as is acknowledged and practiced, it cannot be otherwise in regard to the metallic currency, whether of gold, silver, or copper. A wealthy and refined people, accustomed to keep everything about them in good order, ought to have the same attention paid to the current money, so constantly in their hands and their pockets. As far as practicable, it ought to be kept neat and legible; it ought not to be worn to smoothness, nor, in the case of precious metals, be materially reduced in bullion value.

"This doctrine has been recognized in England, where, in 1774 to 1788, there was a great recoinage of the old worn-out guineas, at an expense to the treasury of over half a million pounds sterling. Another instance has just been brought to our notice. In 1866 a large amount of worn silver coin was received from the Bank of England, and recoined.

[1] To show approximately the proportion of banking transactions which are settled through the clearing-house, Sir John Lubbock, (in a paper read before the Statistical Society in June, 1865,) made the following analysis of twenty-three millions sterling which passed through his bank in a few days:

Amount settled through clearing-house	£16,346,000	or 70 per ct.
Checks and bills not passed through clearing-house	5,394,000	or 24 per ct.
Bank notes	1,216,000	or 6 per ct.
Coin	139,000	or 6 per ct.
	£23,095,000	

From this statement it appears that 70 per cent. of banking transactions are settled through the clearing-house, and consequently without the use of money. Of the remainder, also, 24 per cent. are settled without the use of money by means of checks and bills; nearly 5½ per cent. are settled in bank notes, and little more than one-half per cent. in coin.

"In general, when a renovation of coins has been effected, it has been on the occasion of reducing the standards, either of weight or fineness, or both. Such has been the case in this country, and in England, France, Germany, Spain, and other countries. This is a very cheap way of keeping the coins in order; but even where there is no such reduction, a recoinage of worn and spoiled pieces would not be a very serious charge upon the treasury, because (unlike the paper moneys) they constitute but a small part of the pieces circulating. They wear very slowly, for one thing. But the more important consideration is that they are constantly going abroad, where they find their way to the foreign melting pot and reappear with other names and devices. Of all the many millions that have been coined here, in gold and silver, a very small proportion now bears the stamp of the United States; and when the sovereigns, francs, and thalers come back to us, we treat them in the same way; so that a busy commerce keeps the coinage new and good, and lightens the loss which might otherwise be vexatious and burdensome. Still, in specie times, there is much gold and silver current that ought not to be; and that which is worst circulates most, by a fixed law of human sagacity or self-care.

"If this proposition be true of gold and silver, it is no less so of copper or nickel coins. They ought to be kept clean and legible, and when they cease to be so, the mint ought to be authorized and enabled to take them back, and give new pieces in their stead."

CURRENT OF THE PRECIOUS METALS.

The current or movement of the precious metals appears to have always been counter to the march of civilization, or from the new to the older countries. As discovery and settlement has progressed from east to west, from Asia to Europe, from Europe to the Americas and to Australia, so the gold and silver has been constantly flowing backward upon the same lines, from Europe to Asia, and from America and Australia to Europe.

It may be asserted that in general the flow of the precious metals is always from those countries where the value of the imports exceeds the value of the exports, and towards those where the value of the exports exceeds the value of the imports. The balance of trade is settled with gold and silver. This balance of trade has long been in favor of India and China, and there has been a constant flow of the precious metals in that direction. The total amount of bullion absorbed in India from 1800 to 1864 exceeded £256,000,000, and the bullion coined in India from 1800 to 1865 exceeded £231,000,000.[1]

In 1863 the gold and silver sent to India exceeded the exports by £19,398,315. The amount sent in fourteen years, from 1851 to 1864, inclusive, appears to have been nearly $651,000,000,[2] or an average of about $46,500,000 a year, as shown by the annexed table.

[1] Statesman's Year Book, 1868.

[2] Hunt's Merchants' Magazine and Mineral Resources U. S., p. 621.

Exports of gold and silver to Asia in fourteen years.

	England.	Mediterranean.	Total.
1851	$8, 362, 500	.....	$8, 362, 500
1852	12, 116, 210	.....	12, 116, 210
1853	23, 550, 000	$4, 240, 000	27, 790, 000
1854	15, 555, 000	7, 255, 000	22, 821, 000
1855	32, 075, 000	7, 620, 000	39, 695, 000
1856	60, 590, 000	9, 950, 000	70, 540, 000
1857	86, 477, 170	10, 180, 291	96, 657, 461
1858	25, 444, 250	16, 150, 000	31, 594, 250
1859	33, 298, 120	7, 340, 280	40, 638, 400
1860	40, 620, 182	8, 120, 204	48, 740, 386
1861	36, 399, 175	7, 980, 000	44, 379, 175
1862	53, 551, 045	9, 150, 000	*61, 701, 145
1863	38, 236, 191	29, 281, 000	67, 517, 191
1864	37, 079, 196	41, 255, 942	78, 335, 139
Total in fourteen years	$503, 365, 035	$147, 522, 718	$650, 885, 753

Professor Jevons, in an article upon the variation of prices and the value of currency since 1782, says:[1] "Asia, then, is the great reservoir and sink of the precious metals. It has saved us from a commercial revolution, and taken off our hands many millions of bullion which would be worse than useless here. And from the earliest historical ages it has stood in a similar relation to Europe. In the middle ages it relieved Europe of the excess of Spanish American treasure, just as it now relieves us of the excess of Australian treasure. The 'Indian trade,' says Macpherson,[2] 'arose to a considerable magnitude at the same time that the American mines began to pour their treasures into Europe, which happily has been preserved, by the exportation of silver to India, from being overwhelmed by the inundation of the precious metals, as it must have been had not such exportation taken place.' And 'Ragnal affirms that the Spaniards must have abandoned their most productive mines of silver in America, as they had already abandoned many of the less productive ones, if the progress of the depreciation of silver had not been somewhat retarded by the exportation of it to India.'"

Lees, who has written upon the drain of silver to the East, estimating the currency of India as equal to that of Great Britain, or £80,000,000, and the population at 180,000,000, says:

"It requires but very little calculation to show that India is capable of yet absorbing silver to the amount of Rs. 4,000,000,000, or £400,000,000, in addition to this amount for the purposes of currency alone. Nor must it be forgotten that India is able to support a population many millions more numerous than she at present possesses; nor on the other hand that England has many means of economizing the use of coin, which, in consequence of her immense extent of area, will be denied to India, if

[1] Journal Statistical Society, London.

[2] Commerce with India, p. 337.

not forever, for many years to come. If, then, it be admitted that there is even a shadow of truth in these estimates, it may not be unreasonable to conclude that there is a possibility, distant it may be, yet still a possibility, of the requirements of India for currency purposes approaching the enormous sum of £500,000,000 in silver coin.[1]

DECREASE IN THE PRODUCTION OF GOLD.

The statistics of the production of gold in California, Australia and other countries show very clearly the familiar fact that in all newly discovered gold regions a maximum production is soon attained and is succeeded by a gradual but certain decrease owing to the exhaustion of the placer deposits. Thus, in California, the maximum product was attained in the year 1853, when the shipments were about $55,000,000, and the production was doubtless from $60,000,000 to $65,000,000 in value. It is now much less than half of that amount. In Australia, in the same year, (1853,) the reported shipments from Victoria amounted to 3,150,020 troy ounces, and the production was nearly $60,000,000 in value.[2] In 1867, the shipments were only 1,433,687 ounces, much less than half as much as in 1853. The apparently nearly uniform production of California for the past ten years, judging from the shipments of treasure from the port of San Francisco, is the result of the opening of other gold and silver producing regions in Nevada, Idaho, Oregon, and Arizona, which, so far as their production depends upon placers, are in their turn liable to rapid exhaustion. In British America and in Idaho and Montana the production of gold is now rapidly diminishing.

Russia is the only country in which a nearly uniform production has been maintained through a series of years. This may perhaps be explained by the fact that the mines have not been free to all, and consequently comparatively few persons have been engaged in developing them. The climate, also, is unfavorable to rapid and continuous working, and the method of washing placer gravel by machinery in use there is necessarily slow and gives limited results, which cannot compare with those obtained by the gigantic system of sluicing practiced in California, and Australia. There has also been in Russia a constant extension eastward of the gold region by new discoveries, extending even to the Pacific coast, and there is doubtless an immense area of virgin ground from which the gold supply of Russia may be for a long time maintained at the present figures, or, possibly, greatly increased, especially if all restrictions upon mining are removed, and the country is thrown open to the skilled miners of other regions. This Siberian gold field, with the great mountain region south of it, extending into China and India, is the only extended region now known in regard to which there is any uncertainty in respect to its probable future yield of gold.

[1] The Drain of Silver to the East and the Currency of India, by W. Nassau Lees: London, 1864.

[2] Calculated at $19 per ounce.

The existence of very ancient workings in the Altai is significant, and leads us to question whether this great interior region has not already yielded up its most accessible treasures.

PRODUCTION OF GOLD FROM PLACERS AND FROM VEINS COMPARED.

It must be remembered that the production of gold from placers is necessarily transitory and comparatively abnormal, inasmuch as the placer miner takes advantage of the work which has been performed by the grand operations of nature extending over enormous periods of time. He, in fact, "cleans up" gold which has been already mined. The force required to detach the metal from its rocky matrix has been applied. The vein-stone has been broken out and ground up by the power of streams rolling for unnumbered ages over the rocks, and by the resistless power of glaciers, covering the mountains, filling the valleys, and everywhere cutting away the rocks and veins of the mountains, and throwing the fragments into the rivers, there to be ground and distributed by the currents in terraces and bars while the grains of gold settle to the bottom.

To obtain an ounce of gold from a ton of quartz rock requires a certain amount of force. The rock must be broken and ground to dust. The operation is slow and tedious. It may be said, in truth, that every ounce of gold in placers has required the expenditure of force equal to that now required to extract the same quantity from veins. The advantage in cheapness of production which the placer miner has over the quartz miner is thus made manifest. The work of mining and crushing has been performed for him by nature.

As soon, therefore, as placer deposits are comparatively exhausted the miners will be driven to the veins, a normal production of gold will begin, and it may be said, in general, that every ounce of gold, wherever produced, will require a nearly equal expenditure of power. Of all metals gold is the most uniform in its mode of occurrence. The conditions in which it occurs in veins are nearly the same in all parts of the world. Its common matrix is quartz, and the percentage of the metal in the vein-stone in all workable veins may be considered as remarkably uniform. Other metals are found in a variety of conditions; sometimes with one matrix and sometimes with another of a very different nature and hardness. They are also in combination with a variety of elements from which it is more or less difficult to separate them, and the quantity of such metals in different veins varies greatly. They may thus be produced in some places or countries very much cheaper than in others. The cost of transportation varies greatly. The conditions of production are so varied and different in different parts of the world that these metals require in some places much more or less labor than at others, and thus a given weight of the products can never represent a constant or uniform expenditure of labor. Not only mechanical but chemical processes are involved for their isolation. With the metal gold in

veins, on the contrary, the conditions are so simple and sim that to produce a given weight of it requires nearly the same amount of labor in any part of the world.[1] It does not occur like the ordinary metals in great beds and masses, but is disseminated in comparatively small grains in a vast amount of hard rock. The operation of separating it from this rock is simply a mechanical one. The quartz must be crushed and ground, and as the hardness of this mineral is nearly the same all over the world, and as the percentage of gold in all workable veins of it is remarkably even,[2] compared with workable veins of silver or other metals, it will be seen that gold is the best measure or evidence of applied power or labor that we can have. It is this, combined with the other valuable qualities of the metal, its utility, beauty, and indestructibility, and its almost universal distribution[3] that renders it above all other substances the most appropriate and desirable for money.

PROBABLE RISE IN THE VALUE OF GOLD.

In proportion as the miners exhaust the store of mined gold, which nature has so bounteously deposited in the placers, the gold production will become more equable and constant, and, at the same time, more costly. We may confidently rely upon a large production from veins in the future, especially if such mining is encouraged by suitable legislation. Yet under the most favorable conditions the production of gold from veins cannot be expected to be as great and rapid as it has been from the placers. With this continued decrease in the annual production it seems probable that gold will soon begin to sensibly appreciate in value unless some new and unlooked for discovery of placers shall be made, of which, however, there does not appear to be much probability.[4]

It was argued by Chevalier and others soon after the great discoveries of gold in California and Australia, that gold would necessarily depreciate in value—that its purchasing power was destined to be much lessened

[1] This, of course, is stated in a very general way, and there may be exceptions.

[2] It is not here intended to maintain that there are not great differences in the richness of veins within certain limits, but that the range of difference in general is not great. The general average yield of the most profitable mines is generally not over $15 to $20 per ton. Of 66 veins in Tuolumne county, California, visited by Mr. Remond, the average yield was about $28 per ton, the extremes being $4 and $180. The two highest yields, viz., $107 and $180, were from veins respectively six inches and two inches in thickness. Excluding these two the average of the remaining 64 veins or mines is $25 per ton.

[3] The distribution of gold may be said to be coincident with the mountain chains of the globe. There is no extended region, no great political division of the globe without its gold fields. It is a notable fact, also, that it occurs chiefly in mountain regions where water-power can be readily obtained for its extraction.

[4] The great and at present but imperfectly known gold region of Siberia and China, has already been mentioned, pp. 96 and 102. There is in addition to this a possibility of extensive virgin placers being found in Africa; some indications of the existence of a valuable gold region there have already been discovered. Some recent discoveries are reported in Mexico, but these are probably quite local in extent.

by the great influx of the metal from these new sources. But the relative value of gold has not changed as much as was expected, and it would now seem that the supply did not more than keep pace with the ever-increasing demands of commerce and industry, stimulated as they have been by an increased supply of gold. The wonderful increase of the industrial activity of the world, resulting chiefly from the varied developments and applications of the physical sciences, has been sufficient to appropriate all the excessive production of the past 20 years.[1]

In regard to the effect of the increased production of gold upon prices, Professor Jevons makes the following general observations:

"If the state of prices here [Great Britain] then depends upon prices in India, we should be backward in making predictions of their future course. But we may speak with the more confidence of the accomplished results of the gold discoveries. Prices had been falling with little interruption from 1810 to 1849. The years 1836–'39 form a temporary but remarkable exception. In 1849–'52 prices were unprecedently low, and *cæteris paribus*, we might have expected that after another period of speculation, and its corresponding relapse of trade, prices should descend still lower. But prices in 1858 were still 18 per cent. above those of 1852.

"Since 1858 enormous fluctuations have taken place in the price of many commodities. The price of cotton has been quadrupled and again halved. Corn has fallen to what seems a natural minimum price, and meat and fodder have greatly advanced. There has been a great recent fall, too, in the price of many kinds of imported produce, yet when the average of all kinds of commodities is struck we find that prices since 1858 have been uniform in an unprecedented manner. The average fall since last year has been trifling. If we compare prices now (1865) with what they were at their lowest in 1849, we find there has been a rise of 21 per cent. If we take the average of 1845–50 as our standard of comparison the rise is 11 per cent. The real permanent rise due to the gold discoveries is probably something between these, or nearer the higher limit, 21 per cent. The gold discoveries have caused this rise of price. They have also neutralized the fall of prices which might have been expected from the continuous progress of invention and production, but of which the amount is necessarily unknown. It may be confidently asserted, then, that the Californian and Australian discoveries have had a considerable effect in reversing the previous course of prices, but it is impossible to state the amount of that effect with any approach to certainty."[2]

The demand for money increases with the increased activity of trade

[1] "The power of man is already increased immeasurably beyond the force which is inherent in himself, and the result is the same as if human force had experienced an extraordinary development. One man is now equal in productive power to ten or twenty men in earlier times. To multiply the potency of a thing is practically the same as to multiply the thing itself—indeed, in many cases, it is very much better. If we are to take into account the vast number of steam engines in use other than locomotives, it is not beyond the truth to say that the power of man in Europe has been trebled during a single generation by the appliance of steam power alone."—*Patterson*, "*The Science of Finance*," pp. 93, 94.

[2] Journal Statistical Society of London, xxviii, pp. 307, 308.

and industry. Industrial expansion is so directly affected by the scarcity or abundance of money that an increase in the rate of discount by the Bank of England represses industrial enterprises and paralyzes trade. The circulation of money is checked and it accumulates in the banks. Under the old "mercantile" or protective system in England, the quantity of specie in a country was regarded as a measure of its wealth, and the object of the system was to promote importation of the precious metals.[1]

Henceforth, in view of the constantly increasing industrial development of the Christian nations, in which China and Japan are soon to participate, and in view of the decreasing production of gold—in other words, with an increasing demand and a decreasing supply—it appears inevitable that gold must soon rapidly appreciate in value. This is a possibility which should engage the attention of financiers and economists.

The revolutions in commerce which may grow out of our increased intercourse with China and Japan may result in their taking the surplus of the grain crops of the Pacific coast instead of gold and silver only in exchange for their commodities. As soon as this takes place the drain of bullion to the east will be partly arrested and lead to the accumulation of silver and gold among other nations, and thus compensate for the diminution of the product. To within a recent period, silver in preference to gold has been required for payments in China, but gold is now much more freely received than it formerly was. The shipments of gold from San Francisco direct to China have increased from $965,887 in 1854 to over $9,000,000 in 1867.

The decrease in the production of gold has been noted by Newmarch, who says it appears to have been diminishing since 1863, and that it is certain that the demand for it will increase yearly with the development of the commerce of the world, the progress of the arts and inventions, the increase of production of salaries, revenues, and the abolition of the restrictions which check industry and international exchanges. He says, also, that it must not be forgotten that sooner or later great quantities of gold and of silver will be used to replace the non-convertible paper currency yet in use in certain countries. In Europe—Russia, Austria, Italy, and Turkey—it is probable that there are at least 400,000,000 sterling of paper money, of which a great part will be gradually replaced by specie when the countries become more rich and stable in their government.[2]

[1] A late writer on the science of finance points out the fact that although in Great Britain the protective system has been abandoned for free trade, yet protection has been practically revived in the monetary legislation, and still more by the Bank of England. The repeated raising of the rate of discount has been applauded because it tends to increase the import and repress the export of precious metals. It is easy to see that any legislation which represses the exportation of gold and silver operates practically as a protective tariff.

[2] Newmarch, in "Enquête sur les Principes et les faits Généraux qui regissent la Circulation Monétaire et Fiduciare," folio v, 1867, p. 539.

MEANS OF PROMOTING THE PRODUCTION OF THE PRECIOUS METALS.

ENCOURAGEMENT OF VEIN MINING.

In view of the continued decrease in the production of gold from placer deposits, it becomes important to encourage and promote the extraction of gold from veins in every possible way. There are other great reasons for encouraging vein mining enterprises. They are permanent in their nature, and promote the general development and prosperity of the country by attracting a fixed population, composed of artisans, agriculturists, and others.[1] In California, thriving towns and villages spring up around the quartz mines in the interior, where, without the mines, all would be comparative desolation. The superficial placers in California and elsewhere are soon worked out and deserted, and the placer miners are constantly roving about without fixed homes or property. It is somewhat different in regard to the deep placers and cement mines; they partake of the nature of permanent vein mines, yet are not so attractive as centres of population.

It is an extremely encouraging fact that vein mining in California and Australia is now, or at least was in 1866, more successful than at any former period. The number of successful vein-mining enterprises is increasing. In Australia, this branch of mining appears to have been extraordinarily developed, and to be followed to relatively greater extent than in California. Of the total gold production, of nearly 1,500,000 ounces in 1866, more than 500,000 were from quartz veins. The exact ratio of the production from the two sources was as 35 to 65.

In 1867, of the total of 1,433,687 ounces exported, 560,527 ounces were taken from quartz veins, and 873,160 ounces from alluvial workings. This shows the ratio per cent. of gold produced from quartz veins to that from placers to be as 39 to 61.

It is not possible to ascertain exactly the present production of the quartz mines of California, but it is probably less than one-third of the gross yield of the State, but is increasing. The number of stamps in 1866 was 4,997, many of which, however, were idle.[2] In Australia there were 5,437 stamps. In December, 1867, the number of stamps in the several mining districts was 5,529, and the aggregate horse-power employed in crushing and hoisting was 9,555.[3]

[1] All gold-producing regions become large consumers, not only of the necessaries of life, but of manufactured articles of all kinds and of luxuries. This is shown in a striking manner in the gold regions of California and Australia, and in Nevada.

[2] There was no machinery of special interest to quartz miners shown in the Exposition, excepting, perhaps, the beautiful hoisting engines, steel cages, and machines for drilling rocks, and the concentrating tables of Rittinger. It is believed that the stamps and other appliances in California for the extraction of gold from quartz are unrivalled, yet there is great room for their improvement, and for improvement of processes of treating the sulphurets.

[3] Further interesting statistics of quartz mining in Australia, received since the foregoing pages of this report were printed, will be found in the appendix.

GOVERNMENT PROTECTION REQUIRED.

It is a primary duty of the government having a public domain of such great extent and wonderful richness to foster and protect mining enterprises, not only in order to promote the production of gold, silver, and ordinary metals, but as one of the best means of stimulating immigration, settlement, and the march of industry in all directions. Mining, considered in its importance to the wealth of the country, is an interest which cannot be neglected in legislation without serious loss.

The veins of gold, silver, and other metals should be regarded as the heritage of the people, and while these veins should be left free to all who choose to work them, they should not be completely abandoned to hap-hazard destructive development. The government should exert over them an intelligent protecting and directing care, and adopt such laws and regulations as will best promote permanent successful mining, preventing waste, the loss of the precious metals by careless and ignorant working, the complication and conflict of titles, and the holding of claims for merely speculative purposes, without any efforts being made to open and work them.

Nearly all the great exhibitions of mineral products in the Exposition illustrated the value of government direction and regulation of mining industry. The most satisfactory and perfect exhibitions were those made under the direction of government mining engineers. The collections were methodical and complete exhibits of the mineral resources of each country, and they were accompanied by maps and sections of mines in detail and by statistical publications prepared with the greatest care every year. The relations of position of the veins of ores and of beds of coal to the geological formations were shown by geological maps and sections and by models on a large scale, showing not only the inequalities of the surface of great districts of country, but the position of the coal beds below the surface, and the location of every mine.

By fostering mining enterprises and by thoroughly educating and training men to conduct them, many countries, whose resources in the precious and other metals are comparatively meagre, are successful producers of gold and silver from ores and veins such as in the United States would not be regarded as worth the labor of working. Every portion of an ore is utilized, and valuable products are obtained where without science and skill they would be wasted in residues. It has been shown in these pages that gold ores produced upon the slopes of the Rocky mountains and found to be "rebellious"—difficult to work—have been transported with profit, in a partly worked state, over the immense plains and across the whole breadth of the States east of the Mississippi, and then shipped across the Atlantic, to be successfully worked at Swansea, in Wales, simply for the want of a proper development of metallurgical science and industry in the United States. We must not lose sight of the fact that we not only send some of our ores abroad to be worked,

but that many of our young men are also sent abroad to obtain that thorough education and training in government institutions which they are unable to obtain at home.

IMPORTANCE OF A NATIONAL MINING COLLEGE.

The establishment of a national mining college would be one of the best or most effective means of securing the proper working of the mines and of promoting permanent and profitable mining enterprises, and thus tend to maintain a large production of the precious metals, especially from veins and deep placers, or wherever capital and skill is required. The dissemination of accurate information regarding mineral veins and their contents, and upon the various methods for extracting and reducing the ores economically, would prevent much of the present ill-directed energy and expenditure of time and money, often upon localities where there is little room to hope for success. Such institutions are absolutely necessary to gather the teachings of experience and to place them in a form available to the many persons now interested and yet to be engaged in mining, and to the prospectors who are penetrating our unequalled mineral regions in all directions and are constantly discovering new sources of wealth. The country cannot do too much to sustain and encourage the men who are thus prospecting the unexplored and almost inaccessible portions of the public domain, and to whom we are chiefly indebted for the discoveries which have been made. We should not leave them to labor unaided, but should follow them by organized explorations, by careful examinations of the veins and mineral deposits which they discover, and by the speedy publication of reliable and full information upon them. One of the prominent features of a school of mines should be practical laboratories and metallurgical works upon a moderate scale, in which the students could take practical lessons in the working of ores by all the known and approved methods, including the mechanical preparation of ores, their concentration by water and by fire in furnaces, or their reduction in pans or otherwise. These laboratories would be miniature metallurgical establishments, where ores of all kinds, "docile" or "rebellious," would be received, experimented upon, and treated by the best methods, while the theory of the processes would be fully given and the chemical reactions explained, so that the students would obtain a thorough knowledge and comprehension of the principles involved in the chemical treatment of ores and be prepared to adapt themselves to other circumstances in which they might be placed when called upon to treat ores in regions remote from supplies. Such a government mining school would not only directly promote mining industry, but it would greatly increase the amount of exact scientific knowledge among the people, and thus promote, in the most effectual manner, general scientific education, the results of which would be felt in all our industrial pursuits.

It is gratifying to all the friends of mining industry to know that the establishment of such an institution is already engaging the attention of Congress. Foremost among its advocates is Senator Stewart, of Nevada, who in 1867 introduced and ably supported a bill for the organization of a National School of Mines.

CORPS OF MINING ENGINEERS SUGGESTED.

In connection with, and as partly growing out of, such a mining college, the government should organize and make provision for a corps of mining engineers, to be filled subsequently by the graduates of the college; the members of the corps to have rank and promotion corresponding with the grades of the corps of military engineers.

Such a body of thoroughly educated men should be charged with the duty of exploration of our mineral regions; with the collection of information upon them; with the preparation of reports upon mineral deposits, and memoirs upon mining and metallurgy, all of which would form the basis for publications at regular intervals, giving to the people such information as would best promote their interests and the national prosperity.

Engineers, so educated and sustained by the government, would be animated by laudable ambition and enthusiasm, and would be strengthened by an *esprit de corps* tending to their moral and æsthetic elevation. They would be in a position to give independent and reliable opinions and advice upon the value of our mineral deposits and the best method of developing them.

Such an organization would open a new and inviting field to our young and enterprising men, the graduates of schools of science, and others, who seek a career in the fields of science.

In view of the recognized necessity of thorough technical education to the highest industrial and commercial development of a nation, the organization of a national corps of mining engineers has an increased importance; for, as already argued in regard to the influence of a mining college, it would have an immense influence in promoting general scientific education, thereby causing an exact knowledge of the fundamental laws of nature to pervade the people, and giving them a greater power over our vast material resources.

Another great means of increasing the production of the precious metals is the construction of railways across the country, by which prospectors and supplies can be carried into the heart of what are now comparatively unexplored and unknown mineral regions; and by which machinery can be delivered at moderate cost to extensive regions already known, but remaining comparatively dormant for the want of rapid and cheap communication with the centres of supply both east and west.

CHAPTER X.

UNIFICATION OF GOLD AND SILVER COINAGE.

EVILS OF A DIVERSITY IN THE SYSTEMS OF WEIGHTS, MEASURES, AND COINS—ADVANTAGES OF A SIMPLE UNIVERSAL SYSTEM—MOVEMENT FOR MONETARY UNITY—MONETARY CONVENTION—OBSERVATIONS OF MR. BECKWITH, MR. KUGGLES, AND SENATOR SHERMAN ON THE TREATY—PROPOSITIONS BY MR. KENNEDY ADOPTED BY THE COMMITTEE—INTERNATIONAL MONETARY CONFERENCE—ARGUMENT FAVORING A 25-FRANC COIN—PROFESSOR LEVI'S SPEECH—REPORT OF DELEGATION FROM GREAT BRITAIN—REPORT OF ROYAL COMMISSION—VIEWS OF M. CHEVALIER—OPINIONS EXPRESSED IN THE UNITED STATES, AND THE PROPOSED LEGISLATION—CONCLUSION.

The inconveniences and losses arising from the great diversity of systems of weights, measures, and coins among the chief nations of the earth have long been felt and acknowledged, but they are becoming greater and more evident with the constantly increasing facilities for international communication, by which the people and the commodities of remote regions are brought into constant and close contact.

The collections in the department of weights, measures, and coins of the Paris Exposition comprised no less than 36 different systems of weights, based upon 36 different units; 67 different systems of measures, based upon 62 different units; and 35 different standards of gold and silver coin belonging to 18 different monetary systems, based upon 18 different units or measures of value.

ADVANTAGES OF A UNIVERSAL SYSTEM.

The numerous benefits to be derived from a universal system, simple and uniform, in place of this great incongruity and disorder, are not always present to the minds of those who are not occupied with the study of this subject. They may be grouped under the heads of educational, economic and scientific, and commercial. Some of the advantages under each of these heads will be noted.

EDUCATIONAL.

The nature and relations of numbers, together with the systems of weights, measures, and coins, belong to the elementary studies of children in common schools. They are the rudiments or beginnings of knowledge taught by all nations, of every-day use through life, and nothing more generally useful or necessary is subsequently learned even by those who live to be venerable philosophers and statesmen. But however indispensable this part of knowledge is, no common school undertakes to teach more than a part of it. So many systems without any common or connecting principle, or with so many different principles of

evolution, cannot be mastered and retained in the mind without long study and great efforts. It is practically impossible for the great portion of the people to acquire a complete knowledge of the many different systems, and, indeed, it is rare to find those who acquire and retain any permanent knowledge of the systems of any one country. The incoherent and illogical systems are difficult to remember, and the recollection of them becomes dim and uncertain, if not frequently revived.

If the systems of all countries were effectively resolved into one, based upon a decimalized unit, this entire branch of useful knowledge would come within the easy comprehension and reach of every child, and the time required to learn and understand it would be many times less than is now necessary for the incongruous systems of any one country.

ECONOMICAL AND SCIENTIFIC.

The subject becomes more interesting, if not more important, in its connection with the studies of the more advanced student. No one can acquire a thorough, or even a respectable knowledge of political and social science without an easy familiarity with the various systems of weights, measures, and values. The relation of labor to capital, for example, is a subject which at present attracts serious attention in all civilized countries, and an intelligent inquiry involves the study of social and industrial organizations, and the products of labor and skill of many kinds in many countries. These investigations cannot be made useful, comparisons cannot be drawn, and instructive results be attained without a knowledge of the numerous systems.

The science of economics is, for the most part, based upon statistics, and the study of a wide range of statistics is impossible without the use of the keys which unlock them and render them intelligible. But so great is the labor of conversion of numerous systems into the one system of appreciation most familiar and easy to the mind, that foreign statistics, to a very great extent, as they are presented to us, are but approximations and rough estimates embracing many errors. The advantages of a uniform system of measures and values in collecting and diffusing useful knowledge in this department are obvious. They are specially evident to those who have been led to study the Exhibition and learn the lessons taught by the products and statistics of various countries. They will be evident to the readers of the reports on the Exposition. The labor of preparing the present report and of deducing conclusions would have been greatly lessened if the statistics of various countries had been presented in one uniform system of weights and values. Its accuracy and its value would also have been greatly enhanced.

COMMERCIAL.

The numerous and intelligent body of men engaged in commerce in all countries are familiar with the importance of a uniform system of measuring quantities and values.

Commerce is the exchange of products; quantity and value are elements of exchange, and conversions of quantities and values from one system to another, or rather from all systems into the one most habitual to the individual, and in which his appreciations will be most accurate is the endless labor of the merchant. To find the equivalent of one quantity in another system of expressing quantities, or of one value in another monetary system, by conversion, is indeed considerable labor, and if the data or elements of the computation do not previously exist in the mind the attempt will generally end in a resort to formulas or to tables used mechanically and without understanding them. Much time is lost in such computations, and the labor often necessitates the employment of experts at high salaries. All such difficulties operate as hindrances to trade and commercial expansion. Witnesses examined before the Royal Commission stated that the smaller manufacturers and traders of Great Britain are deterred from engaging in foreign transactions by the difficulties attendant upon a diversity of weights and measures, and by the difficulty of calculating exchanges and of remitting small sums from one country to another. Commercial statements, invoices, and lists of prices expressed in the moneys of foreign countries are not readily intelligible in England or in the United States. The adoption of an international uniform monetary system would facilitate and lead to the extension of the money-order system to foreign countries, by which the remittance of small sums could be made at will by the people.

Monetary systems are theories for measuring and computing values, and exist chiefly in matters of finance and account. Coin is but the material expression of parts of those systems, made to pass from hand to hand as measures of value in exchange of products and property, and whenever the monetary systems are harmonized corresponding changes in coin will naturally follow.

Among the most useful things which have become nearly universal among the nations are the numerals of the Arabs and the alphabetic letters of the Romans. A conviction of the benefits of these unities is felt in every industry, every profession and occupation, every branch of science, art, and literature, and a like conviction of the importance and necessity of a universal system of weights, measures, and values is growing in the public mind—in the mind of the whole civilized world;—it spreads with the increase of commerce, the exchange of ideas, and the diffusion of knowledge.

A movement so universal, so peaceful and harmonious, and so desirable, is not likely to cease nor diminish, but to augment in force and velocity. The inequality of the movement hitherto is remarkable. Several countries have entirely abolished their ancient incongruous systems and adopted the metrical-decimal system, which though not perfect is thought by many to be the best that has yet been found.

Numerous other countries have adopted portions of this system, while Great Britain and the United States have legalized the two sections rela-

ting to weights and measures, rendering the use of them permissible. The monetary section makes the slowest progress. To this branch of the subject the attention of the governments participating in the Paris Exhibition was particularly invited by the Emperor of France, which resulted in the formation of an International Committee at Paris in 1866, and an International Conference in 1867.

The following extracts from the reports and documents show the nature of the inquiries and discussions of the Committee and the Conference, the result of their labors, the subsequent action of Congress, the movements in England, and the present state of the subject.

MONETARY UNITY.

The subject of monetary unity is appropriately introduced by Baron de Hock as follows:

"The inconveniences which result from the diversity of monetary systems exceed even those growing out of the diversity of the systems of weights and measures. These are confined to the trouble and loss of time occasioned by the tedious calculations required to pass from one system to the other; still the objects which are weighed or measured continue the same, and may be made use of anywhere. In the case of coin, on the contrary, besides similar calculations of allowance which are necessary, the objects themselves—that is, the coin—lose a portion of their value in passing from one country to another." * * * * *

"It cannot be doubted that the universal unification of coins, by creating a common medium of circulation, constitutes one of the most effective means for the development of general commerce. Such a medium, adopted by every State and individual, saves the loss of time and the trouble caused by the computation to which it is constantly necessary to resort to ascertain the precise value of the different coins; it reduces to a minimum the rate of exchange, that painful burden to commerce; it obviates the losses from exchange of money, to which the arts and manufactures and, not less, travellers are subject; it increases the utility of money, and thereby even its value; it diminishes the needs of circulation, and tends finally to an immediate and radical cure of the crises which spring up in commerce by the accumulation of money at one point and its absence at another.

"The idea of a unification of the coins is so elevated and the purpose so useful that, whenever a favorable situation renders its adoption possible, no progressive people, desirous of entering upon the great and fruitful road of universal commerce, can remain indifferent or reject it, unless from motives of the last importance."[1]

At the preparatory conference relative to the establishment of an international system of measures, weights, and coins, held at the Palace of Industry in Paris, May, 1866, Mr. Le Play stated the object of the meeting as expressed in the notice. During the Exhibition of 1855 a

[1] Extracts from the report of Baron de Hock.

special committee, of which many persons present were members, considered the means of simplifying the operations of international commerce by the adoption of a common system of weights and measures. The conference caused the formation of societies for that especial purpose in many countries, particularly in England. Many of these societies expressed the desire to revive the question at the Universal Exhibition of 1867.

At the second session Mr. Le Play, Commissioner General of the Exhibition, introduced Mr. Leone Levi, professor of King's College, Cambridge, as a delegate of the metrical committee of the British Association for the Advancement of Science, and the International Association for obtaining a uniform decimal system of measures, weights, and coins. Mr. Leone Levi then read the following note:

"Universal exhibitions have shown that much remains to be done to facilitate international communications, and among the chief wants is a common system of measures, weights, and coins.

"This want was greatly felt at the International Exhibition of 1851, and on its close the London Society for the Encouragement of Art, Industry, and Commerce informed the government that it would be well to consult with neighboring nations to see if measures could not be taken to hasten the adoption of a uniform system for the entire world.

"At the Universal Exhibition of Paris in 1855, the juries and committees of the different countries, to the number of two hundred, signed a declaration that one of the best ways to promote industry would be to adopt a universal system of weights and measures.

"At the London Exhibition of 1862 a like report was made by the juries of different kinds, particularly that of chemistry.

"Other international and scientific assemblies, recently held, have expressed the same opinions. The International Statistical Congress, at Brussels in 1853, Paris in 1855, Vienna in 1859, and Berlin in 1863, found great difficulty in reconciling the differences of unity, giving the statistical facts of different countries. Different societies, such as the British Association for the Advancement of Science and the Academy of St. Petersburg, have expressed their opinions upon the advantages to science of uniformity in scientific communications. And finally, after the Paris Exhibition, a special international association was founded to obtain the adoption of a decimal system of measures, weights, and coins. Certain legislative measures of considerable importance have been taken for the same purpose.

"A committee was formed in 1862 in the House of Commons to consider the practicability of a simple and uniform system of weights and measures, to be applied to foreign commerce as well as to domestic trade, and upon its report the legislature declared the metrical system to be a law. The adoption of decimal coins has also been considered by the legislature, and the discussion of the subject has progressed.

"The German states have also found the necessity of unity in their

weights and measures, and after two official conferences at Frankfort in 1862 and 1865, they concluded to favor the metrical system. Many other states, such as Spain, Portugal, and Italy, have taken similar steps, and by a treaty relative to coins, recently concluded between France, Belgium, Switzerland, and Italy, those states have formed a monetary union. The United States have lately undertaken the same subject. An inquiry has been instituted, and a bill has been introduced into Congress for the adoption of the metrical system. Yet there remains much to be done to complete the work, for there is not only a difference in the national systems of measures, weights, and coins, but there are local and customary measures that embarrass trade and complicate international reckonings. The great difficulty is in a practical application; and the best way to overcome this is to exhibit the measures, weights, and coins in use in different countries at the Universal Exhibition of 1867, and to settle it when the committees having the consideration of the subject meet in Paris. This is suggested as the best plan.

"For these reasons, the International Association to obtain a uniform decimal system of measures, weights, and coins, and the metrical committee of the British Association for the Advancement of Science have instructed me to agree with the Commissioner General upon the means of realizing an exhibition, under the auspices of the Commission of the Universal Exhibition for 1867, comprising the following articles:

"1. A collection of weights and measures, their multiples and submultiples, and every legal weight and measure used for any purpose.

"2. Two collections to show both sides of all the current coins of last government issue, with specifications of pure metals in them of gold, silver, or copper, and their size, weight, &c.

"3. All official documents on the subject, and particularly every report of legislative committees in regard to a change in the weights, measures, or coins of the countries.

"The two associations desire, morever, that an international conference be formed for the Exhibition of 1867, composed of competent persons in a scientific, industrial, and commercial point of view, to study the objects and documents exhibited, so as to adopt as soon as possible a uniform decimal system for every country. These conferences might also consider analogous questions of a more scientific nature, and of interest to the progress of civilization."

Mr. Leone Levi added, that the association to obtain a uniform system of weights and measures, instituted after the London Exhibition of 1855, had decided, after much inquiry, to encourage the use of the metrical system, because it was founded on nature, and was the most scientific and generally known.

Mr. Mathieu stated that the Bureau of Longitudes, with which he was connected, had printed the bill in English, with the translation and the comparative table of weights and measures. If the decimo-metrical system of weights and measures were adopted as an international system,

the trouble among the scientific men of all countries about the unities of different nations and provinces, in commercial relations, would be avoided. The bill mentioned by Mr. Mathieu, as introduced into the House of Commons, is a happy step toward the desired result.

The following is a translation of the treaty concluded December, 1865, above referred to by Mr. Levi:

MONETARY TREATY BETWEEN FRANCE, BELGIUM, ITALY, AND SWITZERLAND.

ARTICLE 1. Belgium, France, Italy and Switzerland unite to regulate the weight, title, form, and circulation of their gold and silver coins. No change is made for the present, in legislation, relative to copper coins for the four countries.

ART. 2. The high contracting parties bind themselves not to coin, or permit to be coined, any gold other than in pieces of 100, 50, 20, 10, and 5 francs in weight, title, tolerance, and diameter, as follows: All these coins shall be of the fineness or title of .900, with a tolerance of two thousandths above or below the legal standard. The tolerance in weight shall be for the 100 and for the 50 franc pieces, one thousandth above or below; for the 20 and 10 franc pieces, two thousandths; for the 5-franc pieces, three thousandths. The weights and diameters are these:

Gold coins.—100 francs, weight 32.258.06 grams, diameter 35 millimetres; 50 francs, weight 16.129.03 grams, diameter 28 millimetres; 20 francs, weight 6.451.61 grams, diameter 21 millimetres; 10 francs, weight 3.225.80 grams, diameter 19 millimetres; 5 francs, weight 1.612.90 grams, diameter 17 millimetres.

The different states will receive all the above coins when not worn to one-half per cent., or the devices effaced.

ART. 3. The contracting governments bind themselves not to coin, or permit to be coined, silver pieces of 5 francs, except in the following weight, title, tolerance, and diameter: The weight of each 5-franc piece shall be of twenty-five grams; its tolerance in weight, three thousandths; its fineness, .900; its tolerance in title two thousandths; and its diameter thirty-seven millimetres.

They will receive the above pieces at par, unless reduced one per cent. by wear, or the device is worn off.

ART. 4. The high contracting parties will coin hereafter pieces of 2 and 1 franc, 50 and 20 centimes, only under the following conditions of weight, title, tolerance, and diameter: The fineness of these pieces shall be of .835; their tolerance of title, three thousandths; their tolerance of weight, five thousandths for the first two, .007 for the 50-centime piece, and .010 for the 20-centime piece. Their weights and diameters as follows:

Silver coins.—2 francs, weight 10 grams, diameter 27 millimetres; 1 franc, weight 5 grams, diameter 23 millimetres; 50 centimes, weight 2.50 grams, diameter 18 millimetres; 20 centimes, weight 1.00 gram, diameter 16 millimetres.

The above pieces shall be recoined by the respective governments when reduced by wear, or when their devices shall have become effaced.

ART. 5. Pieces of 2 and 1 franc and of 50 and 20 centimes of a different coinage from the above, shall be withdrawn from circulation by the 1st of January, 1869. This term is extended for the pieces of 2 and 1 franc, issued in Switzerland, by the law of January, 1860.

ART. 6. The silver coins authorized in article 4 shall be a legal tender privately to the sum of fifty francs. The nation issuing them shall receive them in any amount.

ART. 7. The public banks of each of the four countries will receive the coins of article 4, to the sum of 100 francs, in payment to said banks. The governments of Belgium, France, and Italy will receive the Swiss 2 and 1 franc pieces of 1860, under the same conditions, as equivalent to the coins of article 4, and under the reservation relative to wear.

ART. 8. Each of the contracting governments binds itself to receive from banks or individuals the small coins they have issued, and return the equivalent in current coin, (gold or 5-franc silver pieces,) provided the sum presented be not less than 100 francs. This obligation shall extend two years beyond the expiration of this treaty.

ART. 9. The high contracting parties agree not to issue a greater amount of these 2 and 1 franc, 50 and 20 centime pieces of Article 4, than six francs for each inhabitant. The amount thus fixed in accordance with the last census and the presumed increase of population is fixed at—

	Francs.
For Belgium	32,000,000
For France	239,000,000
For Italy	141,000,000
For Switzerland	17,000,000

Exclusive of the above sums the different governments can issue of coins already in circulation in the following proportions: France, in 50 and 20-centime pieces, by the law of May 25, 1864, 16,000,000; Italy, in 2 and 1 franc, 50 and 20 centime pieces, by the law of August 24, 1862, 100,000,000; Switzerland, in 2 and 1 franc pieces, by the law of January 31, 1860, 10,500,000.

ART. 10. Hereafter the date of issue shall be stamped on all the gold and silver coins issued by the four governments.

ART. 11. The contracting governments shall give the quantity of their issue of gold and silver coins every year, the amount collected for melting, and make a general annual report of the proceedings. They shall likewise give notice of important facts in regard to the circulation of their issues.

ART. 12. Any other nation can join the present convention by accepting its obligations and adopting the monetary system of the Union in regard to gold and silver coins.

ART. 13. The execution of the reciprocal engagements contained in

the present convention is left to the high contracting powers, who bind themselves to pass laws for the purpose as soon as possible.

ART. 14. The present convention shall remain in force till the 1st of January, 1880. If it be not repealed a year before the expiration of that term, it shall remain in force for an additional period of 15 years, and so on, until repealed.

ART. 15. The present convention shall be ratified, and the ratifications exchanged at Paris, within six months, or less time, if possible.

EXTRACTS FROM THE REPORT OF THE COMMITTEE, APPOINTED IN FRANCE, TO EXAMINE A BILL RELATIVE TO THE TREATY.

A monetary disturbance has existed in France for several years, caused by a variety of circumstances.

Our monetary system has two standards for its basis:

In the first place, the silver franc, of the weight of five grams, and of .900 fineness, is the monetary unity by the law of the 7 Germinal, year XI; and the 20-franc gold piece, weighing 6.451, of .900 fineness, by article six of the same law, 7 Germinal, year XI, is the legal equivalent of the franc multiplied by 20. That law, fixing our present monetary system, reckoned a kilogram of pure silver at 222 francs 22 centimes, and one of pure gold at 3.444 francs 44 centimes; which makes the difference in value of the two metals in the proportion of 1 to 15½. Can this relation remain fixed, or is it modified by circumstances? It has been stationary for nearly one-half a century. Silver was the usual money; gold, in small quantities, was at a premium. About the year 1835, by reason of improvement in refining, the 5-franc silver pieces of the earliest coinage were hunted up and melted to extract the gold they contained. Yet the relation between silver and gold continued the same. But the discoveries of gold in Russia, California, and Australia, between the years 1846 and 1850, brought gold abundantly into the European markets. The metal fell in value, and 5-franc silver pieces were more than ever sought for. The government took note of this, and a committee was appointed in 1850 to investigate it. Thiers was its chairman. The political troubles of the time prevented action. The difference of value of the two metals increased, and speculators began to buy up the smaller silver coins. Two other circumstances hastened the disappearance of silver from circulation: the loss of our silk-worms and the American civil war compelled us to buy silk and cotton from the east to keep our factories going; and, as silver is more valued in those distant lands, we had to pay for the imports in silver, having no produce to exchange for them. And there was yet another reason to make silver more valuable: the improvement in the circumstances of our laboring classes increased the necessity of small coin for change. A committee in 1857, and another in 1861, were commissioned to investigate the subject. It was shown that the yield of silver and gold from the New World, from the time of its discovery to 1846, was as two to one; whereas the yield now was three of

gold to one of silver. It was also shown that silver 5-franc pieces had almost entirely passed out of circulation; that out of 214,463,000 francs in small coin, issued since the year XI up to 1864, there remained 160,000,000 in circulation; and that the last issues of 43,000,000, made since January 1, 1856, were immediately absorbed by speculation. The fact was serious.

To increase the weight or fineness of our gold coins, in order to restore the equilibrium of value between the two monetary standards, was almost impossible, on account of the vast amount of gold in circulation. It would have been a great expense to the State, without considering other inconveniences. The greatest want was of small change. Ten and 5-franc gold pieces had supplied the place of silver 5-franc pieces. The bill of May 25, 1864, proposed to withdraw all the 2, 1, $\frac{1}{2}$, and $\frac{1}{4}$ franc pieces of .900 fineness from circulation, and to issue the same coins of .835 fineness. These new pieces, considered merely as change money, were to be taken only in amounts of 20 francs and less, between private individuals, but good for any amount in the public banks. The right of making and circulating was reserved to the state. This seemed to be the proper remedy, as speculation would not disturb the alloyed small coin. The legislature liked the plan, but modified it by issuing only 50 and 20 centime pieces of .835 fineness. The reasons for this are given in Mr. Gouin's report. There were two dominant ideas: one was a determination not to alter the franc of .900, the expression of our monetary unity; the other was to see if the alloy of .835 would be acceptable to the people. This was wise; it answered for the present, and reserved something for the future; and so the bill was made a law.

A two years' trial has shown that the new coins of .835 have been welcomed by the public. Speculators have pounced upon the 2 and 1 franc pieces and bought them out of circulation, except those worn so much there is nothing to be made out of them.

Now is the time to resume the labor of 1864, and satisfy the public that complain of the scarcity of change, and such is the object of the bill now submitted to your consideration. It proposes to extend the law of May 23, 1864, to the 1 and 2 franc silver pieces. The proposition is sustained by a convention concluded with the three nations nearest to France that have adopted the French monetary system. The advantages of a single monetary system for all nations need no discussion. Besides the convenience to border countries and travellers, it facilitates commerce by giving a common and certain measure to currency. It is a consequence of free trade and that instinct that prompts people to unite their interests by commerce and industry. We hope soon to see uniformity of weights everywhere, and we believe France will set the first example to all other nations.

We have therefore given, as a principle to be examined in detail, our complete approbation to the convention, and the bill which is the result of it.

A question of another nature arose in the committee: As the two monetary standards have long been a source of annoyance, why did we not adopt gold as the only standard, like England and many other nations, and thus settle it definitely at once? The committee was not in favor of it. We certainly cannot say what the future may have in store for us, but nobody can say but what the measure may be soon adopted; it is too soon yet. Though theory and logic may be for a single standard, facts show that the double standard offers great advantages in practice. The two help each other, and in times of crises one serves as a balance to the other. The use of both metals, moreover, facilitates our commercial relations with other countries, by allowing our merchants a choice of the coin best suited to the stranger. Does a difference of the value between the two metals, of late years, give a sufficient cause for such a radical reform? If silver is preferred to-day, the preference may change by the discovery of vast silver mines, or a great reflux of silver from the East by reason of the sale of our manufactures in those countries. The proposed law prudently confines itself to present necessities, without pretending to look for the future.

The committee, in all its deliberations, has kept one idea in view: By the declaration preliminary to the law of 7 Germinal, year XI, the franc of five grams weight and .900 fineness is the point of departure, the foundation of our entire monetary system. As soon as it is reduced to .835 it disappears, and would not its reduction be in violation of the above law? It might also cause some confusion in our foreign trade.

The objection was fully considered, if the legal franc ceased to exist, would the fact be due to the new law? The 1-franc pieces are gradually disappearing, owing to the difference of value between gold and silver. The 1-franc pieces now in circulation are so much worn they hardly have the intrinsic value of the new .835 pieces. True, the government could coin more of .900, but speculation would soon remove them from circulation. The new law, then, does not cause the harm. It existed before, and the law alleviates it. It is not just to say the franc will have ceased to exist in its material expression when the new law comes into force. It will still preserve its expression in the 5-franc silver piece, its fifth multiple, which is retained in our monetary system, though becoming scarce, and circulates freely in the three countries that joined France in the convention of the 23d December, 1865.

However, as legislation ought to be precise in these matters, we have endeavored to make the text of the new law as plain as possible by introducing two amendments. The first calls the 2 and 1 franc the 50 and 20 centime pieces change-money, which is their true character. The second declares it "no violation of the law of 7 Germinal, year XI, which makes the franc the basis of the French monetary system." Thus, all doubts and false interpretations are removed. The new 1-franc piece, of less value and of restricted circulation, is created by necessity. The old franc is retained as money of account, and as the normal measure of gold and silver, in conformity to law.

OBSERVATIONS BY MR. BECKWITH ON THE TREATY.

Mr. Beckwith, the United States commissioner general to the Paris Exposition, in a letter to the Hon. William H. Seward, Secretary of State, under date of Paris, July 17, 1866, makes the following observations upon the treaty:

"It results from these proceedings that a uniform system of coinage is established in the four countries named—uniform as regards the unit, the metallic standards, and the value of the pieces to be coined. Each country retains the double standard of gold and silver with the relative value of 1 to $15\frac{1}{2}$.

"The composition of gold coin remains in the proportion ($\frac{9}{10}$) nine parts of fine gold to one of alloy, and the coinage of gold is restricted to pieces of the value of 100 francs, 50 francs, 20 francs, 10 francs, and 5 francs.

"The composition of the silver 5-franc pieces remains in the proportion of ($\frac{9}{10}$) nine parts fine silver to one of alloy; but the composition of silver coin of smaller values is reduced from $\frac{9}{10}$ to ($\frac{835}{1000}$) 835 parts fine silver to 165 parts of alloy, a reduction in value of about 7 per cent.

"The coinage of this class is restricted to pieces of the value of 2 francs, 1 franc, 50 centimes, and 20 centimes, and limited in amount to six francs per head of population, which should give about 32,000,000 francs for Belgium, 239,000,000 francs for France, 141,000,000 francs for Italy, and 17,000,000 francs for Switzerland.

"This inferior money is a legal tender between individuals to the amount of 50 francs in a single payment, and receivable for dues to the government without limit. It follows from these measures that the unit of the monetary system (1 franc of the standard of $\frac{9}{10}$) will cease to be coined; but it retains a nominal existence; it remains money of account and is still the unit of the monetary system, and the measure of all values, though it has no material existence except in its multiples, of which the quintuple or 5-franc piece is the smallest coin.

"The reduction in the value of small silver coin brings the standard of this class in harmony, I believe, with the small silver coin of the United States, under the law of 1850. If this be so, the metallic standards both of the gold and silver coin of the United States are now in harmony with those of the four countries named, and the standards being in harmony and the systems all decimal, it only remains to harmonize the coin in order to produce reciprocal circulation. For this purpose a common unit does not appear to me to be necessary.

"However numerous the monetary systems and different their units, if they are all decimal and their standards of coin alike, it is only necessary that the pieces coined in each be in harmony with their own system to produce the uniformity required for circulation in common, provided that the unit of each monetary system be capable of expression in the multiples and sub-multiples of the other systems.

These approximations are much easier of attainment than unity. No

substitution of the units of one country for those of other countries need be made; very slight modifications of existing units and standards, with decimalization, would produce a common measure of values, and assimilate all the principal monetary systems in the manner required for the reciprocal circulation of coin. Modification is the easiest method of reforms.

"Coining a unit of one system would then be of necessity coining at the same time a multiple or sub-multiple of the unit of all the other systems, and the pieces struck in conformity with each system would bear the same relations to the coins of the other systems that the several pieces of any one system bear to each other.

"Neither is it of moment what names may be given to coins in different countries, nor how numerous their varieties or various their values, because they will all be aliquot decimal parts of harmonious systems, the coin of each being referable to its own unit, and referable with equal facility to the multiples or sub-multiples of the units of the other systems.

"In like manner a small change in the standard of British gold coin from $\frac{916}{1000}$ to $\frac{900}{1000}$ would complete the unity of standards of gold coin, since the whole civilized world nearly, except England, has adopted the standard of $\frac{9}{10}$ fine.

"Our gold dollar, for example, is equal to 517 French centimes; a reduction of 17 centimes (3½ c.) would leave it an exact multiple of the French unit, or franc, and the equivalent of five francs. A reduction of 12 centimes (2½ c.) in the value of the British unit or sovereign would leave it a multiple of the franc, and the equivalent of 25 francs, and consequently a multiple of the dollar, and the equivalent of five dollars.

"Modifications of this kind are not difficult: they are common. They produce little inconvenience to the public; they do not disturb business, nor trench upon prejudices; they come into use almost imperceptibly, and in this case would leave the unit of each national system—those great traditional measures of value so deeply rooted in every mind—in effect undisturbed, with their various mottoes, emblems, and effigies, and with all the impregnable habits of thought, and even the superstitions which cluster around them.

"The tenacity with which nations and peoples hold to their ancient measures of value is remarkable, and whether it springs from a principle or a prejudice, it is a fact so firmly fixed that it is difficult to eradicate; nor is it worth the labor, or even desirable, if a common language of values can be otherwise attained."

OPINION OF MR. S. B. RUGGLES.

Before the meetings of the international committee for examining the question of a uniform coin had commenced, Mr. Ruggles, delegate from the United States, was enabled, through the introduction of Monsieur Michel Chevalier, senator of France, who took much interest in the subject, to confer fully with M. de Parieu, vice-president of the *conseil d'etat*,

and one of the two representatives of France in negotiating the monetary convention of 23d December, 1865. He suggested to M. de Parieu the expediency, and, indeed, urged the necessity, of modifying that portion of the treaty which prohibits either of the four nations who had made it from issuing gold coin of any denominations but those of 5, 10, 20, 50, and 100 francs. "This necessity is obvious at once from the fact that the gold coin most in ordinary use in the United States is the half-eagle of $5, which, with a slight diminution, could be readily reduced to 25 francs in value. This coin, when exported to France, in order to be readily and generally current, must there find itself side by side with some well-known French coin of like weight, diameter, and value." The propriety of this suggestion M. de Parieu not only admitted at once, but expressed his belief that the treaty might be modified by the four nations, in thirty days, to meet the necessities in this respect of the United States.

Similar suggestions were made to M. Rouher, chief minister of state, and his attention was directed to the fact that the Congress of the United States, in recently authorizing the issue of one of our smaller coins, had given to it a precisely even metric weight and metric diameter, (being five *grams* in weight and two *centimetres* in diameter,) thereby scattering widely through the pockets of the American people the means of studying the metric system by specimens of the *metre* and its derivative the *gram*, constantly visible.

Mr. Ruggles afterward suggested to the Emperor that France could coin a piece of gold of 25 francs, to circulate side by side on terms of absolute equality with the half-eagle of the United States and the sovereign, or pound sterling, of Great Britain, when reduced, as they readily might be, precisely to the value of 25 francs. The Emperor then asked, "Will not a French coin of 25 francs impair the symmetry of the French decimal system?" To which it was answered, "No more than it is affected, if at all, by the existing gold coin of five francs;" that it was only the silver coins of France which were of even metric weight, while every one of its gold coins, without exception, represented unequal fractions of the metre.

It was also stated to the Emperor that an eminent American statesman, Mr. Sherman, senator from Ohio, chairman of the Finance Committee of the Senate of the United States, and recently in Paris, had written an important and interesting letter, expressing his opinion that the gold dollar of the United States ought to be and readily might be reduced by Congress, in weight and value, to correspond with the gold five-franc piece of France.

The letter of Mr. Sherman, addressed to Mr. Ruggles, dated the 18th May, 1867, is as follows:

LETTER FROM SENATOR SHERMAN TO MR. RUGGLES.

"MY DEAR SIR: Your note of yesterday, inquiring whether Congress would probably, in future coinage, make our gold dollar conform in value to the gold five-franc piece, has been received.

"There has been so little discussion in Congress upon the subject, that I cannot base my opinion upon anything said or done there.

"The subject has, however, excited the attention of several important commercial bodies in the United States, and the time is now so favorable, that I feel quite sure that Congress will adopt any practical measure that will secure to the commercial world a uniform standard of value and exchange.

"The only question will be, how this can be accomplished.

"The treaty of December 23, 1865, between France, Italy, Belgium, and Switzerland, and the probable acquiescence in that treaty by Prussia, has laid the foundation for such a standard. If Great Britain will reduce the value of her sovereign two pence, and the United States will reduce the value of her dollar something over three cents, we then have a coinage in the franc, dollar, and sovereign, easily computed, and which will readily pass in all countries; the dollar as five francs, and the sovereign as 25 francs.

"This will put an end to the loss and intricacies of exchange and discount.

"Our gold dollar is certainly as good a unit of value as the franc; and so the English think of their pound sterling. These coins are now exchangeable only at a considerable loss, and this exchange is a profit only to brokers and bankers. Surely each commercial nation should be willing to yield a little to secure a gold coin of equal value, weight, and diameter, from whatever mint it may have been issued.

"As the gold five-franc piece is now in use by over 60,000,000 of people, of several different nationalities, and is of convenient form and size, it may well be adopted by other nations as the common standard of value; leaving to each nation to regulate the divisions of this unit in silver coin or tokens.

"If this is done, France will surely abandon the impossible effort of making two standards of value. Gold coins will answer all the purposes of European commerce. A common gold standard will regulate silver coinage, of which the United States will furnish the greater part, especially for the Chinese trade.

"I have thought a good deal of how the object you propose may be most readily accomplished. It is clear that the United States cannot become a party to the treaty referred to. They could not agree upon the silver standard; nor could we limit the amount of our coinage, as proposed by the treaty. The United States is so large in extent, is so sparsely populated, and the price of labor is so much higher than in Europe, that we require more currency *per capita*. We now produce the larger part of the gold and silver of the world, and cannot limit our coinage, except by the wants of our people and the demands of commerce.

"Congress alone can change the value of our coin. I see no object in negotiating with other powers on the subject. As coin is not now in general circulation with us, we can readily fix by law the size, weight

and measure of future issues. It is not worth while to negotiate about that which we can do without negotiation, and we do not wish to limit ourselves by treaty restrictions.

"In England, many persons of influence, and different chambers of commerce are earnestly in favor of the proposed change in their coinage. The change is so slight with them that an enlightened self-interest will soon induce them to make it; especially if we make the greater change in our coinage. We will have some difficulty in adjusting existing contracts with the new dollar; but as contracts are now based upon the fluctuating value of paper money, even the reduced dollar in coin will be of more purchasable value than our currency.

"We can easily adjust the reduction with the public creditors in the payment or conversion of their securities, while private creditors might be authorized to recover upon the old standard. All these are matters of detail to which I hope the commission will direct their attention.

"And now, my dear sir, allow me to say in conclusion that I heartily sympathize with you and others in your efforts to secure the adoption of the metrical system of weights and measures.

"The tendency of the age is to break down all needless restrictions upon social and commercial intercourse. Nations are now as much akin to each other as provinces were of old. Prejudices disappear by contact. People of different nations learn to respect each other as they find that their differences are the effect of social and local custom not founded upon good reasons. I trust that the Industrial Commission will enable the world to compute the value of all productions by the same standard, to measure by the same yard or metre, and weigh by the same scales.

"Such a result would be of greater value than the usual employments of diplomatists and statesmen."

This letter was received by the committee with lively interest, and with the approbation of the Imperial Commission was ordered to be published in French and English.

MR. KENNEDY'S PROPOSITIONS ADOPTED BY THE COMMITTEE.

Previously to the 22d of March the international committee had taken no steps to discuss the subject of uniform weights, measures, and coins, their attention up to that time having been mainly given to the erection and arrangement of the pavilion in the interior garden of the Exposition for the actual exhibition and comparison of the weights, measures, and coins of the respective nations represented in this universal concourse.

The subject of a uniform coin did not actually come into discussion, either in the international committee or the sub-commission on coins, until early in the month of May.

On the 8th of June Hon. John P. Kennedy, who had been added to the committee, submitted seven resolutions, which, with the remarks introducing them, were subsequently adopted by the committee in sub-

stance, and almost literally, and were made the basis of its report. These resolutions, as adopted by the committee, translated, are as follows:[1]

"The committee, considering that the adoption of a uniform system of coins presents advantages of convenience and economy in the regulation of international exchanges so evident, that it commends itself to every enlightened government; considering, furthermore, that such a measure cannot be realized without the sacrifice by many peoples of their old and customary instruments of trade, and that their interest requires this change should be gradual and continuous, and therefore that the first steps of the transformation should be as simple as possible and disembarrassed of all incidental complication, therefore submits the following propositions:

"1st. The first condition to be fulfilled is the adoption of an identical unity in the issue of their gold coins by the different governments interested in the question.

"2d. It is desirable that such coins should everywhere be struck at the standard of nine-tenths.

"3d. It is desirable that every government should introduce among its gold coins at least one piece of the same value as a piece in use among other interested governments, so that there may be a point of common contact in all the systems, and therefore each nation should endeavor gradually to assimilate its monetary system with that which may be chosen as a uniform basis.

"4th. The series of gold coins now used in France having been adopted by a large portion of the people in Europe, is recommended as a basis of the uniform system desired.

"5th. Considering that the most important of the monetary units, by a fortunate and accidental circumstance, can be adapted to the French gold piece of five francs, by slight changes, that piece would be most suitable as a basis for a monetary system; and coins struck upon that basis would become the multiples of that unity as soon as the convenience of interested nations would permit.

"6th. It is desirable that the different governments determine that the coins struck by each nation, in conformity with the uniform system proposed and agreed upon, should pass as legal tenders in all those countries.

"7th. It is very desirable that the system of two different monetary standards should be abolished wherever it still exists.

"8th. It is very desirable that the system of decimal numeration should be universally adopted, and that the coins of all nations should be of the same standard and form.

"9th. It is desirable that governments should agree to adopt common measures of control, so as to secure the integrity of coins in their issue and in their circulation."

The "international committee on uniform weights and measures and

[1] *Vide* Rapports et Procès-verbaux Comité des Poids et Mesures et des Monnaies, p. 18, and for the resolutions submitted by Mr. Kennedy, p. 49.

coins," charged with the preliminary study of the question, took into consideration not only what is theoretically and abstractly possible, but what is commercially and financially practicable. The subsequent duty of fixing a common coin as the monetary unit required an international conference, composed of representatives duly accredited from the various nations, and vested with diplomatic powers.

INTERNATIONAL MONETARY CONFERENCE.

The delegates to the monetary convention had expressed in the name of their governments a desire to see the union, as yet restricted to four countries, become the germ of a union more extended, and of the establishment of a general monetary circulation among all civilized states.

A copy of the text of the treaty, or "monetary convention," was forwarded by the French government to the government of the United States, with an invitation to participate in an international monetary conference to be held in Paris in June, 1867, during the progress of the Universal Exhibition. The object of this conference was declared to be to call out an interchange of views and discussion of principles; to seek for the basis of ulterior negotiations.

In accordance with this invitation the Hon. Samuel B. Ruggles, who was then in Paris as United States commissioner to the Universal Exposition, was specially authorized to represent the government of the United States in the conference. The proceedings of this conference, and of the "preliminary international committee" on uniformity of coinage, organized by the imperial commission of the Universal Exposition, were fully reported from time to time by Mr. Ruggles to the State Department, and were followed by a very elaborate and interesting report upon the whole subject. This report, in addition to a full discussion of monetary unification, contains valuable statistics and information upon the amount of gold and silver in circulation; upon the coinage of the principal nations, and upon the weights and fineness of gold and silver coins and the relative value of gold and silver. Extended extracts from the reports have, therefore, been made.

On the 17th of June, 1867, the invited nations, 19 in number, responded by sending 32 duly accredited delegates, and the International Monetary Conference met for the first time at the hotel of the Department of Foreign Affairs, under the presidency of his excellency Marquis de Moustier, the minister for foreign affairs. There were eight successive sessions, terminating on the 6th of July, 1867, at which the whole subject was discussed at length, and full reports and arguments were presented.[1]

[1] The proceedings of the conference were fully reported in an official volume, entitled *Conférence Monétaire Internationale; Procès-verbaux. Paris: Imprimerie Impériale, 1867.* A translation accompanied by translations of other documents and letters relating to this subject was transmitted to Congress, and was published. (*vide* Ex. Doc. No. 14, 40th Congress, 2d session.)

In opening the labors of the conference, the president said:

"The approximations which the late commercial reforms have wrought between the economic interests of nations ought to result in causing to be appreciated more earnestly than in past time the advantages which would be derived from the unification of coinages. To substitute instead of the variety of monetary types actually in use, metallic coins struck in accordance with uniform regulations, and placed beyond any variations of exchange, would, in effect, be to remove one of the most serious obstacles to the development of international relations. Thus, when in 1865 the delegates of France, Belgium, Italy, and Switzerland had succeeded in forming between those countries a real monetary union, the thought of a more extended association naturally presented itself to their intelligence; thence came the right of accession opened to other countries by a special clause in the convention of December 25, 1865; thence the wish put forth by the commissioners, that studies should be undertaken, in concert, among all civilized states on the question of uniformity of coinage.

"No period could be more favorable to the realization of this wish than that of the Universal Exposition; the government of the Emperor hastened to avail of it, and the acceptance which various governments have pleased to extend to these overtures has shown that the importance of the problem to be solved was universally recognized.

"The dispositions thus manifested from the outset are so much the more precious, as it was impossible to dissemble the difficulties of the task which the members of the conference have to accomplish. Those difficulties are of diverse nature, and to remove them it is important, beyond all, that each state, in view of the great interest it seeks to satisfy, should seek, without exclusive opinions, the best solution.

"The French government is, moreover, pleased, gentlemen, to recognize in the choice of yourselves, on the part of your government, a fresh pledge of the solicitude which, abroad as well as in France, is entertained upon the question submitted to the conference. A study of such delicacy and so complex could not be confided to an assemblage which could present a more complete combination of knowledge required either in the conduct of great affairs, in the management of important financial institutions, or in technical operations."

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Reports and written arguments were presented during the sessions by M. de Parieu, Baron de Hock, and Mr. Samuel B. Ruggles. Extracts from these reports are embodied in these pages.

PLAN OF MONETARY UNIFICATION AGREED TO BY THE CONFERENCE.

The following are the general features of the plan of monetary unification agreed to by the conference:

1. A single standard, exclusively of gold.
2. Coins of equal weight and diameter.
3. Of equal quality, (or *titre,*) nine-tenths fine.

4. The weight of the present five-franc gold piece, 1612.90 milligrams, to be the unit, with its multiples. (The weight of the present gold dollar of the United States is 1671.50 milligrams. The value of the excess over the five-franc gold piece, 58.60 milligrams, slightly exceeds 3½ cents. To encourage the reduction of the United States half-eagle and of the British sovereign to the value and weight of 25 francs, the conference recommended the issue of a new coin of that weight and value by France and the other gold-coining nations. The reduction in value of the half-eagle would slightly exceed 17½ cents; in the sovereign, 4 cents.)

5. The coins of each nation to continue to bear the names and emblems preferred by each, but to be legal tenders, public and private, in all.

The conference further requested the government of France to invite the different nations to answer, by the 15th of February, 1868, whether they would unite in placing their respective monetary systems on the basis indicated by the conference, as above stated; and after receiving their answers, to convene, if necessary, a new or further conference.

A further resolution of the conference recommends that the measures of unification which the nations may mutually adopt be completed, as far as practicable, by diplomatic conventions.

By these proceedings and official reports, the whole question of monetary unification was distinctly presented for consideration and decision to the governmental authorities of the United States, executive and legislative.

By a communication from the Department of State of the 30th May, empowering Mr. Ruggles to represent the United States in the conference, he was directed not only to report its proceedings and conclusions, but to add such "observations as might seem to be useful." He therefore submitted an additional report, mainly explanatory of the grounds taken in the conference in behalf of the United States, but embodying statements which may possibly facilitate to some extent the examination of the subject by the government and others.

EXTRACTS FROM THE REPORTS OF MR. RUGGLES.

"All the independent sovereignties of Europe, with the possible exception of some small portions of northern Germany, were represented in the conference by delegates duly accredited. The delegates from Prussia appear on the roll as representing that power only, but from the fact of their repeatedly abstaining from voting on certain questions in the conference 'without the consent of the Confederated States,' they were practically considered as representing all the states and communities of northern Germany now confederated with Prussia. There were no separate delegates from the kingdom of Saxony, or either of the Hanseatic cities of Hamburg, Bremen, Lubec, or Frankfort. There were separate delegates from Baden, Wurtemberg, and Bavaria. None of the nations west of the Atlantic were represented, except the United States of America.

"The nations appearing by delegates in the conference were entered alphabetically on the roll, in which order they voted. A copy of the roll is hereto subjoined. Including Sweden and Norway as one, they were nineteen in number, being: Austria, Baden, Bavaria, Belgium, Denmark, Espagne, (Spain,) Etats Unis, (United States of America,) France, Great Britain, Greece, Italy, Pays Bas, (Holland,) Portugal, Prussia, Russia, Sweden and Norway, Switzerland, Turkey, Wurtemberg.

"Their aggregate population, European and American, a little exceeds 320,000,000. The population of the dependencies of these nations in Asia is estimated at 190,000,000. There were no separate delegates from any portion of the West or the East Indies, not even from Australia, which had been separately and conspicuously represented in the International Statistical Congress, at London, in 1860, and which still plays a part so important in furnishing gold to British India and other oriental countries.

"It is, indeed, specially noticeable in the reported discussions of the conference how little account was made of that populous quarter of the globe in estimating the world-wide advantages of a common money; and this omission has become more worthy of remark from the circumstance that information reached Paris, soon after the adjournment of the conference, that measures were in actual progress, at Pekin, for striking, for the use of the immense population of China, coins of the weight and value respectively of 20 francs, of 5 francs, and of 1 franc, bearing on their face the head of the Chinese Emperor, thereby assimilating the money of the Celestial Empire to that of Europe.

"The interesting fact is stated in a historical report (recently published by a member of the British embassy) of the money of Japan, that it possesses a coinage of gold and silver in some essential features resembling that of France, particularly in a double standard, under which the ratio of silver to gold is fixed at 13½ to 1.

"It appears that, in ignorance of the actual relative values of the two metals in our Atlantic world, (of 15 or 16 to 1,) these Asiatics had fixed the ratio at only 4 to 1, which great exaggeration of silver they were furthermore induced to continue by a treaty in 1858, under which they were rapidly despoiled of their gold in large quantities by some of the traders from Christian nations. The partial correction of the mistake in 1860, by raising the ratio to 13½ to 1, (if any ratio fixed by governmental regulation be admissible at all,) shows an advance of intelligence in this distant region, inspiring the hope that, in due time, at least a portion of eastern Asia may be brought within a world-embracing and world-protecting belt of monetary unification.

"The British colonies in continental North America, recently consolidated by imperial authority in the 'Dominion' of Canada, were represented in the conference only as a part of the British empire by the delegates from the United Kingdom. That young but rising power, though remaining in form a colonial dependency, now possesses, under the

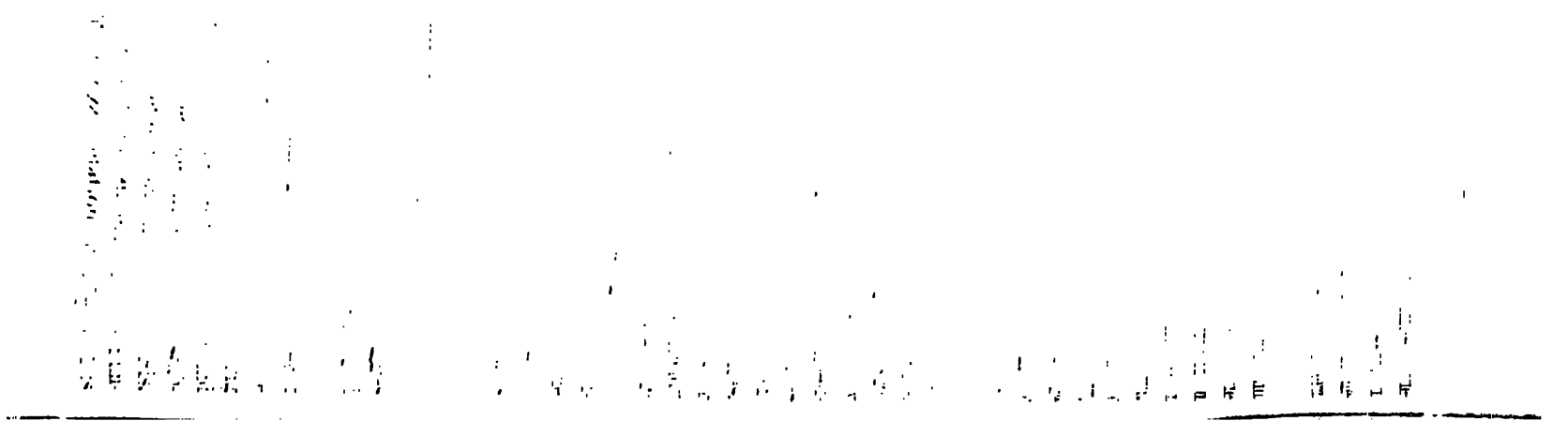
91st section of the act of the imperial Parliament of the 29th of March, 1867, the sovereign and 'exclusive legislative authority' to regulate its own 'currency and coinage,' already much assimilated to the decimal system of the United States. The deep interest in the success of the pending measure of unification manifested by Mr. Bouchette and other intelligent Canadian officials, who were at Paris to superintend the exhibition of the products of their country, affords ground for believing that the general conclusions, and the basis now proposed by the conference, will command the ready assent and co-operation of that active and interesting portion of the North American continent.

"Of the Mohammedan nations, the Ottoman empire was represented in the conference by his Excellency Djemil Pacha, its ambassador extraordinary and plenipotentiary to the court of France. With him was associated the Colonel Essad Bey, the military director of the Ottoman academy in Paris, who had, moreover, officially represented his government in the preliminary 'international committee on uniform weights and measures and coins,' in which body he had manifested a marked desire that the proposed monetary reform might include the coinage of Turkey. At a later stage of the conference his Excellency Mihran-Bey-Duz, member of the Grand Council of Justice and director of the mint at Constantinople, whose early arrival had been unexpectedly retarded, appeared and took his seat as a member.

"The ambassador to France from Persia, (sometimes called the 'France of Asia,') a personage of singular intelligence, had also manifested a lively interest in the proposed monetary reform, but had been obliged to leave Paris on the eve of the first meeting of the conference. It is worthy of notice that the standard of the gold coin of Persia is .900 fine, being the same as that of the United States, while that of Turkey is still higher, being .915 fine. The principal gold piece of Persia is worth 22.27 francs; that of Turkey 22.48 francs.

"The clear and comprehensive vision of the far-seeing advocates in Europe of monetary unification has fully discerned the grandeur of uniting the two hemispheres in one common civilization. M. Esquiron de Parieu, vice-president of the conseil d'etat of France, who presided with eminent wisdom and dignity over the conference at several of its most important meetings, declares, in one of his learned and luminous monetary essays, now lighting the path of the Older World, that 'a monetary union of western Europe and the transatlantic nations would possess an incontestable importance. Above all,' he adds, 'it would produce a grand moral effect.' As if foreseeing with the eye of prophecy a continental, if not a world-wide 'solidarity' for the 'dollar,' founded historically on the past, he adds, 'the Americans can never regard their dollar as a merely national coin, after having borrowed it from their neighboring Spanish colonists.'

"As a matter of historic truth, Spain itself had borrowed the 'dollar' from Austria, during their union under the common empire of Charles



itself fractional, and must be doubled and carried to $\frac{31}{2}$ to make even numbers.

"The franc is simply a monetary word, which expresses five grams of silver nine-tenths fine. It is the French monetary unity. Gold having a value of $15\frac{1}{2}$ times greater than silver, it requires $15\frac{1}{2}$ francs each of 5 grams of silver (say $5\times15\frac{1}{2}=77\frac{1}{2}$ grams) to buy 5 grams of gold, or 155 grams of silver to buy 10 grams of gold. As 31 is the smallest even number of this relation, 31 is the smallest number of francs which can be represented by a piece of gold having an even weight of grams. No enlightened government would consent to confine its gold coinage to pieces of 31 francs and its multiples. We therefore perceive that France has made complete abstraction of metrical weight in its gold coins, not one of which weighs an even number of grams.

"The gold piece of	5	francs weighs.....	1.6125	grams.
"	" 10	"	3.3250	"
"	" 20	"	6.4500	"
"	" 50	"	16.1250	"
"	" 100	"	32.2500	"

"The proposed 25-franc piece would weigh 8 grams .0625, and, in fact, would more nearly approach an even metrical weight than any French gold piece now existing.

"This relation of $15\frac{1}{2}$ to 1 is practically prescribed by the French law, which enacts that 155 (5×31) pieces of 20 francs, being 3,100 francs, shall weigh 1,000 grams, or one kilogram; but the same ratio would exist between 124 (4×31) gold pieces of 25 francs, which would also contain 3,100 francs, and would also weigh one kilogram.

"The United States have never attempted to fix a decimal weight for their gold coins, although they were among the first to adopt a decimal monetary system. The present gold dollar weighs 25.8 grains troy, which is about equal to 1671 milligrams, and exceeds the metrical weight of the French 5-franc piece about $58\frac{1}{2}$ milligrams

"A gram of gold nine-tenths fine is equivalent in round numbers to 30 pence English, or 60 cents of the United States. Consequently, $58\frac{1}{2}$ milligrams taken from the dollar would reduce it about $3\frac{1}{2}$ cents, or $292\frac{1}{2}$ milligrams taken from the half eagle of five dollars would reduce it $17\frac{1}{2}$ cents, being about $3\frac{1}{2}$ per cent.

"It is needless to expatiate on the comparative merits of a decimal, a duodecimal, or a binary system, for the reason that the decimal system has become a fixed fact in a large portion of the civilized world, rendering any change practically impossible. In like manner the unification of the coinage of the world has become a question of a nature more practical than scientific in character, chiefly falling within the domain of commerce and finance.

"To prevent any misapprehension on either side of the Atlantic, it should be distinctly understood that the conference did not propose, nor was any proposition or suggestion made in that body, or elsewhere, to

abandon the use in any way of the word 'dollar,' or 'sovereign,' or 'thaler,' or 'florin,' or 'ruble,' for any other local denomination of money, or in any way to substitute the word 'franc' for any or either of them. By the proposed unification, all those terms will be practically rendered synonymous or mutually convertible, but every nation will continue to use the names with the local emblems it may prefer.

"That such will be the case is now fully evident from the fact that since the adjournment of the conference in July last a preliminary treaty has been signed by accredited representatives from France and Austria, providing for the issue of a gold coin of the weight and value of 25 francs, for the international use and convenience of those two important powers, and by which the 10 florins of Austria are made precisely equal in weight and value to the 25 francs of France, the coin of each nation to be stamped with the head of its respective emperor.

"A specimen or medal in gold, showing the weight and diameter of the proposed coin, with its reverse inscribed '*Or. Essai Monétaire*,' encircling '25 francs, 10 florins, 1867,' has been already struck by order of the government of France, a duplicate of which was recently delivered at Paris to the Emperor of Austria."

A similar specimen or medal in gold has also been struck, inscribed on its reverse "5 dollars, 25 francs, 1867," three duplicates of which, with the proper official letters from M. Dumas, "senator of France and President of the Commission on coins and medals," were intrusted to Mr. Ruggles for delivery to the President, to the Secretary of State, and to the Secretary of the Treasury of the United States. A fourth specimen was presented to the distinguished delegate.

The diameter of this proposed international coin is 24 millimetres, exceeding a little that of the present half-eagle of the United States, and that of the sovereign of Great Britain, while the medallion of the Emperor, in bold relief, on the face of the coin to be issued in France, distinguishes it at once from the ordinary "Napoleon" of 20 francs, which is only 21 millimetres in diameter.

PROFESSOR LEVI'S SPEECH ON THE PROPOSITION OF TAKING THE FIVE-FRANC AS A BASIS OF INTERNATIONAL COINAGE.[1]

With great deference to the proposal of the committee, and much as I agree in the principle therein embodied, I must be allowed to express that it seems to me quite inexpedient and impracticable to take the piece of five francs in gold as the unit of the monetary system for all countries, because it is too small as a gold coin, very easily lost, too costly to pro-

[1] This speech, and the following report by the delegates from Great Britain, of the doings of the international monetary conference, are extracted from the official "Report of the International Conference on Weights, Measures and Coins, held in Paris, June, 1867," and "Report on the International Monetary Conference, &c., presented to the House of Commons by command of Her Majesty," in pursuance of their address, dated March 9, 1868. London: printed by Harrison & Sons. Page 75.

duce, much more subject to wear and tear and diminution in value, and too small for large transactions of commerce and finance. In England the introduction of this piece as a unit would be impossible. But it may be taken as a sub-multiple.

It has been suggested that the five-franc piece in gold is very nearly the fifth of the pound sterling, and that it might be made identical. But the value of the pound is 25.20 and not 25 francs. To reduce the value of the pound to 25 francs, we should have to reduce its weight of gold from 7.322 grams to 7.258 grams; whilst, according to the proposition which we have just passed, to make the gold coinage nine-tenths fine, the pound would become heavier in weight by .0166. We have now some 80,000,000 to 100,000,000 sovereigns in circulation. From 1856 to 1866 only, there were issued 49,200,000 sovereigns. If a new pound were coined of 25 francs exactly, the same would have to circulate together with the old pound of 25.20, but the difference between the two would be so slight that we should constantly mistake the one for the other. It was said that government might declare the value of the pound now in circulation at 25 francs, because in effect it is somewhat lighter in weight, and if necessary a seigniorage might be charged. But allowing all this, such difference would not reach 20 centimes on each pound; and if the government should declare the pound 25 francs, which is worth more, the bullion merchants would soon buy it for exportation. And how would old debts and old transactions be affected by such a change? Two pence per pound would have to be given in each case where contracts are pending on the old coinage; and the labor of altering all the books and accounts for that difference would be still more inconvenient, as it is small and in a manner indefinite.

If, therefore, I cannot see my way to approve of the suggestion of reducing the pound to 25 francs, it would be useless for England, and from an international point of view, that France should coin a piece of that sum, which otherwise would not be required in France. Nor does it seem that the maintenance of the pound is likely to lead to the decimalization of the British coinage. The only scheme proposed for that based on the pound sterling is, that which contemplates the division of the pound into 1,000 mills instead of 960 farthings, but serious obstacles attend the carrying out of the scheme. The first is the necessity of altering seriously all the copper coinage, including the penny, which is an old unit in the kingdom, and some of the silver coins also. Change the penny, and what shall be its equivalent for penny postage, penny toll, and all the taxes and all the wages regulated by that coin? Four mills would be too little; five mills too much. Any change in the name of the copper coinage is necessarily attended with great difficulty. A still greater defect of the pound and mill scheme is that many of the coins which this new system would introduce have no distinct equivalent in the coins already in existence. They would stand alone and unchangeable, except with a sacrifice of fractions in every transaction. Another

defect is the undeniable fact that with three decimals, counting always by thousands, no great facility of calculation, no great economy of time, no great conciseness of expression, would in fact be attained. The number of figures required in the present system to express all the sums from one penny to 10 shillings is 250; in the pound and mill scheme it is 335. It would be easier, moreover, especially as it is more familiar to us in England, to conceive the idea embraced in 17 shillings 11 pence than in 895 mills.

Possibly the liability to errors also is even less in the present system than in the other. The only recommendation of that scheme is the maintenance of the pound. But though bankers and merchants confine their attention to that unit, dealing as they do with large transactions, the government could not overlook the penny, and could not ignore the interests of the millions whose daily transactions might be seriously deranged by such a change. A better mode of arriving at a decimal and international system of coinage, it seems to me, is that England should take the 10-franc piece as a unit, and divide it into 100 pence of the current coin; especially since, in reality, the penny is intrinsically, if not nominally, equal in value to the 10-centime piece.[1] What would be the difficulty of her issuing such a coin, which, as suggested, might be called a ducat, and a tenpenny piece as the tenth part of it? Being altogether a new coin it will be easy to issue it of the new alloy, and nearly all the existing coins would continue untouched. It would certainly be better that the shilling and the half sovereign should be withdrawn, because they would be too like the 10 pence and the 100 pence; but otherwise no change would be caused in any of the coins in use. Should the 10-franc piece be found too small as a unit, we may easily have a larger unit in a piece of 100 francs, or of the value of nearly four pounds sterling. For France the unit of 10 francs in gold would be very convenient, as it would perfect her decimal system, and would improve her money of accounts by taking a unit ten times larger than the franc. The United States would have to double their dollar, but the value of everything is now greater than it was some time ago. We find in England that the halfpenny and the farthing are but little used, since we have to pay a penny now for what we paid a halfpenny before, and the experience of the United States will be the same. What we should aim at is, the adoption of one and the same unit by all nations; a unit with subsidiary coins alike everywhere. We must remember that all questions of prices, wages, fares, &c., are generally by such subsidiary coins as the franc, the pence, &c. Unless we attain uniformity in these we effect no real reform. Now, by adopting the 10 francs we have all

[1] If issued in the first instance as a subsidiary coin or token, the gold ducat might be declared by law to be of the value of 100 pence, notwithstanding the slight difference in relation to their nominal value. Should, however, the coin and the decimal system founded upon it find favor with the public so as to justify the government in declaring it a primary unit, then its relation to the sovereign would be regulated by tariff according to its intrinsic value.

this absolutely, and therefore I commend it to the earnest attention of the conference. I have much pleasure in announcing that the Chambers of Commerce, the International Decimal Association, and the Metric Committee of the British Association, have all decided that great advantage would result by the adhesion of Great Britain to the principles of the monetary convention concluded December 23, 1865, between France, Italy, Switzerland, and Belgium, by article 12, of which convention the right of accession is, under certain conditions, reserved for other states. I apprehend that the British government could not authorize her representatives at the Monetary Conference held at the Ministry of Foreign Affairs to make any engagement on this question, because it has not yet been discussed by the nation; but I do not doubt that the resolutions of this and the other conference will have a great influence on public opinion in England, and that, animated by the most sincere friendship for France and for the great sovereign who so wisely presides over her destinies, and most desirous to be united by material, moral, and intellectual bonds with all nations, England will applaud and accept with pleasure the propositions which we may adopt with a view to introducing uniformity in the coinage of all countries.

REPORT BY THE DELEGATES FROM GREAT BRITAIN.[1]

May it please your lordships, we have the honor to lay before you the minutes of the proceedings of the recent International Monetary Conference which we were instructed to attend on behalf of her Majesty's government.

The invitation to the conference emanated, as your lordships are aware, from the French government, and its object was stated to be the discussion of the means by which a complete or partial uniformity might be established between the various monetary systems at present in existence in the countries of Europe and in the United States of America.

The convention of December 23, 1865, concluded between the governments of France, Belgium, Italy and Switzerland, which established an identity in the weight and fineness of the coins of those countries, as well as in the conditions under which they might be manufactured and pass current, was especially indicated as a basis for the deliberations of the conference; the right of joining the convention having by the 13th clause been reserved to all other countries which might be prepared to adopt its provisions.

The necessity for an understanding between the governments of those four states originated in the alteration of the relative value of the precious metals occasioned in recent years by the influx of gold from the newly discovered fields of California and Australia, and the disturbing

[1] Report, addressed to the Lords Commissioners of the Treasury, by the Master of the Mint and Mr. C. R. Wilson, on the International Monetary Conference, December 2, 1867, signed by Sir Thomas Graham and C. Rivers Wilson.

effect thereby created upon the currencies of those countries which had adopted a double standard.

The law under which the system of the double standard operates in France assumes the hypothesis of an arbitrary relation of value between silver and gold in the proportion of 15½ to 1; and, although no doubt this proportion was exact at the period when the law was passed (1803,) it has been considerably modified by the cause above mentioned, which, during the last fifteen years, has thrown upon the market of the world gold to the extent of £340,000,000 in excess of the provision requisite for sustaining the proportion contemplated by the French law.

In France, and in Belgium, Italy, and Switzerland, where the French system has been adopted, and where, consequently, each of the precious metals is a legal tender, it naturally followed that gold gradually displaced silver as an instrument of exchange, and that the latter almost entirely disappeared from circulation.

The inconvenience occasioned by this state of things was principally felt in the scarcity which it created in the smaller denominations of currency, for which gold is inapplicable, and which are indispensable in the ordinary transactions of life, and some attempts at a remedy were made in Switzerland and Italy, and subsequently in France, by increasing the proportion of alloy in some of the smaller silver pieces, thereby reducing them to the position of subsidiary or token coins. The legislation in the three countries was, however, not unanimous, and differed in some essential particulars, while in Belgium no alteration of any kind was attempted.

Under these circumstances overtures were addressed by the government of the country last mentioned to the French government, suggesting a joint examination by France, Belgium, Italy, and Switzerland, of the difficulties which had arisen, and of the remedies to be applied.

The proposal was accepted, and has resulted in the convention of December 23, 1865.

The convention maintains the double standard, fixing the proportion of pure metal in the case of the gold coins of 20, 10, and 5 francs, and of the silver coin of 5 francs at nine-tenths with one-tenth of alloy, as heretofore, but reducing the proportion of fineness in the silver coins below 5 francs from .900 to .835, these subsidiary coins being only made a legal tender to an amount not exceeding 50 francs, (the same limit as that fixed in the case of the English silver token coinage.)

Uniformity of coinage is established by the convention among the countries that are parties to it, but the obligation of accepting reciprocally the coins struck by the different governments is confined to the public treasuries.

Although the causes which led to this convention were of a special nature, nor are we aware that the promoters of it contemplated any ulterior extension of its principles, the union of so considerable a section of the population of Europe seems at once to have given rise to the expec-

tation that it might be made the means of ultimately realizing the idea, which has been a subject of speculation at various times, of a universal monetary confederation.

That project has now been officially adopted by the French government, and it was for the consideration of it in common that the recent conference was convoked.

Before coming to a decision upon the advisability of accepting the invitation, your lordships had carefully to consider the grounds upon which the participation of her Majesty's government in the proposed inquiry could be justified, and the position which should be assumed by their representatives in the event of their deciding that the proposal should be accepted.

Upon the one hand, the inconvenience experienced by some of the countries of the continent owing to the abstraction of silver from circulation, to which we have alluded, has not been felt in England, whose currency is based upon a gold standard, and where, ever since 1816, silver has occupied a subordinate position, the coins of that metal being of the nature of tokens, and only legal tender to the extent of 40 shillings.

Moreover, the currency adopted by the convention of December, 1865, and avowedly recommended as the model for imitation, being based upon the decimal system, offered so wide a divergence from that in operation in this country, which, whatever differences of opinion may exist as to its theoretical perfection, adapts itself well to the requirements of the nation, that a transition from one system to the other, with its many attendant difficulties and disadvantages, or even any sensible modification of our system in the direction of that contained in the provisions of the convention of December, 1865, could only be contemplated on the strongest grounds of expediency.

Upon the other hand, the advantages to be derived from international uniformity of currency, admitting such a consummation to be feasible, were too obvious to be overlooked, and of too vast an interest not to warrant many sacrifices for their attainment; and it was well known that the subject had already attracted a considerable share of public interest in this country, while the interest evinced in the project by the French government, and the anxiety expressed by them for the co-operation of this country, would naturally carry due weight in influencing the determination of her Majesty's government.

Upon a review of these considerations your lordships decided that it would be proper that her Majesty's government should be represented at the conference, but that their delegates should be instructed to abstain from any act or opinion that might appear to pledge her Majesty's government to the adoption of any particular course of action, and that their mission should be confined to a general consideration of the questions that might be brought forward.

The conference was attended by representatives from twenty different

states,[1] and with the exception of the Austrian commissioner, Baron Von Hock, who immediately after the termination of the conference negotiated on the part of his government, and signed a preliminary treaty of adhesion to the convention of December, 1865, none of our colleagues appeared to have received more ample authority than that which we possessed.

Under these circumstances we felt little hesitation, notwithstanding the reserve imposed upon us by your lordships, in recording our votes upon most of the resolutions submitted to the consideration of the assembly.

We proceed at once to state the several propositions which, with more or less agreement, but in all cases after minute discussion, were affirmed by the conference, and which your lordships will doubtless consider worthy of attention, as embodying the authoritative opinion of the representatives of so many countries, and such various systems of currency, as to the most desirable form of monetary union, and as to the most practical means of accomplishing it.

1. The first question which engaged the attention of the conference was whether it were desirable to seek among existing systems one which could be adopted, in its integrity or with modifications, for the proposed international coinage, or whether an entirely new system should be devised.

Whatever the theoretical advantages or perfections which the latter plan might appear to afford—by allowing, for instance, of the creation of a system based upon a gold decimal unit—it was obvious that the acceptance of such a suggestion was inadmissible in practice, owing to the fundamental changes that it would necessitate. The conference, therefore, had no difficulty in affirming the proposition that "monetary unification may be most readily attained by the adjustment of existing systems, taking into consideration the scientific advantages of certain types and the number of the populations by which they have already been adopted," nor in indicating the system of the convention of December, 1865, as that which might be examined with the greatest advantage. It was understood, however, that this resolution involved no opinion upon the subject of the standard, which was reserved for subsequent and separate discussion, and that it was only intended to imply, with regard to the convention itself, that its relative completeness, its subordination to the metrical system, and the large number of the population (72,000,000) that had already adopted it, recommended it generally as a nucleus for the further development of the principles of an international coinage.

It should be mentioned that in the early part of the present year the Papal government joined the convention of 1865, and that in the month

[1] Austria, Baden, Bavaria, Belgium, Denmark, United States, France, Great Britain, Greece, Italy, Netherlands, Portugal, Prussia, Russia, Spain, Sweden and Norway, Switzerland, Turkey, Wurtemberg.

f April last a law was passed in Greece by which the currency of that ›untry has been remodelled upon the provisions of the convention.

2. An inquiry for the purpose of determining the proper standard to e adopted in any general system of coinage might have been expected › elicit much diversity of opinion in an assembly where the three sys-›ms of a gold standard, a silver standard, and a double standard were ›presented, and the unanimous declaration of the conference in favor f a single and a gold standard may be considered as one of the most nportant features in the deliberations of the conference.

The importance of the decision will be better appreciated when it is orne in mind that only two of the states represented—viz., Great Brit-in and Portugal—possess exclusively a gold standard, and that the uestion of the relative advantages of a single or double standard—which ı France has been much contested—was, as lately as May last, exam-ıed in that country by a government commission, composed of eminent conomists, who pronounced by a majority of voices in favor of main-ıining the double standard. We annex a copy of their report.

The difficulties to which the adoption of a gold standard would be likely › give rise in the countries possessing a silver standard during the period f transition, formed naturally the next subject for consideration, and the onference expressed the opinion that the silver standard might be main-ıined as a transitory arrangement until such time as gold should become he principal instrument of circulation.

3. With the view of facilitating and accelerating the transition from a ilver to a gold currency, it was thought advisable to add a recommenda-ion that care should be taken to fix the relative value of the two metals t such a proportion as would permit the free introduction and mainte-ance of gold.[1]

4. It was resolved that a common unit should be adopted for the gold oinage possessing identity of fineness.

The standard of fineness was recommended to be 0.900, *i. e.*, 9 parts ne to 1 alloy, and, although differing from the proportion in use in our ıint, which allows eleven-twelfths fine and one-twelfth alloy, we saw no eason to prevent us from joining in the recommendation of the other ommissioners, considering that the proportion of nine-tenths is not only hat which was adopted by the convention of December, 1865, but is the lmost universal rule in the mints of Europe and in the United States, nd has even been recently introduced in the coinage of silver dollars at he Hong Kong branch of her Majesty's mint.

The chief recommendation of the proportion of eleven-twelfths consists n the superior hardness of the alloy; but the advantage which it affords n that respect over the coins of nine-tenths fineness is of no considerable mportance. At the same time, to guard against any misapprehension, ve thought it right to qualify our vote by the explanation that the adop-

[1] The English ratio at present is 14.28; the United States ratio is 14½ for subsidiary silver; he French ratio is 14⅝ for subsidiary silver.—W. P. B.

tion of the standard of nine-tenths could only be introduced in England in the event of a recoinage.

5. The renunciation of the principle of a currency based on a standard of silver seemed to imply and necessitate the adoption of a common unit of higher value than at present prevailing in countries not possessing a gold standard, and the piece of 5 francs was that which, in spite of individual objections, found favor with the majority of the commissioners.

Exception was taken to it by some of the members for the practical reason of its insignificant dimensions, and upon the more theoretical ground that it does not perfectly harmonize with the decimal system.

We shared this opinion, and were prepared to have suggested as preferable a 10-franc piece, which would not only be free from these drawbacks, but would be more likely to be acceptable in England, which is accustomed to the higher unit of the sovereign.

A new British coin having the same quantity of gold as the 10-franc piece, with the same proportion of alloy, would be within ¾*d.* of 8*s.* in value. Such a piece could be legally introduced into circulation as an additional member of the present coinage, provided it was issued as a token coin for 8*s.*, and made a legal tender to a limited amount only, such as £4, or 10-franc pieces. It could have inscribed upon it "10 francs," in addition to its current value of "8 shillings."[1] This coin would become the unit of computation, the new pound, or metrical pound, or it might be made the tenth part of a new metrical pound, if a denomination of higher value were demanded. We would thus become possessed of an international coin.

The scheme of coinage which it would be the means of suggesting is one resting upon the penny reduced four per cent. in value, and would include a silver piece of 10 such pence, in addition to the gold piece of 100 pence. The ultimate adjustment of the European and American coinages contemplated would present:

In the French coinage—

1 franc divided into 100 centimes.

In the American—

5 francs ($1) divided into 100 cents.

In the British—

10 francs (gold florin, one metrical pound, or one-tenth of a metrical pound) divided into 100 pence; with the addition, if desired, of 100 francs (one metrical pound, £4 sterling) divided into 1,000 pence.

Such a coin as the gold 8*s.* piece could be produced without expense, owing to the seigniorage of ¾*d.* which it would yield as a token, and the piece could be made sufficiently distinctive by giving it a plain edge. For the issue of such a piece there is the precedent of the silver florin, which was devised to represent the pound and mill system, and to bring that system under the notice of the public. The 8*s.* piece proposed would represent the metrical system founded upon the penny, which has always

[1] It would be better to stamp such a coin 100 pence rather than 8*s.*—W. P. B.

been a rival with the former in general estimation, and which seems entitled to equal consideration at the hands of government. The issue of such a piece, while it brought the metrical system of coinage into notice, would not be conclusive as to the ultimate adoption of that system, but would leave it possible to advance in such a course, or to recede from it at any time without embarrassment.

We may mention that M. de Jacobi, the representative of Russia, threw out the suggestion that the objections to the 5-franc piece on account of its small size might be obviated by the introduction of platinum as the metal of which it should be composed, observing that a supply in sufficient quantities could be obtained from the Russian and South American mines, and that the disadvantages formerly presented by the difficulties of working it had been, in a great measure, removed by recent improvements.

By a subsequent vote, in which we did not feel called upon to join, an innovation was recommended in the principle of the convention of 1865, which limited the reciprocal obligation of accepting the coins of the Union to the public treasuries, by a proposal that the common coin of 5 francs should be made a legal tender throughout the countries which might unite in a monetary convention.

6. The next proposition, viz: whether the proposed system should include a coin equivalent to 25 francs, offered considerations of more special interest to the English delegates, inasmuch as it indicates what, at present at all events, is believed by many persons to be the only probable method by which an alliance may be effected between the English monetary system and that adopted under the convention of December, 1865, by so large a portion of the continent of Europe, and which will, no doubt, receive a still wider extension.

Indeed, as we had occasion to point out, the 25-franc piece is by no means a necessary ingredient or consequence of the scheme recommended by the conference, and was avowedly proposed and supported chiefly in the hope of securing the adhesion of Great Britain, to which, on account of her large monetary circulation, the activity and extent of her commercial transactions, and the influence which they exercise in every foreign country, a natural importance was attached.

At various stages of the discussions the question of equalizing the pound sterling with 25 francs of French gold was brought forward by different members of the conference, with no undue depreciation of the difficulties which must be encountered in carrying the alteration into effect, but with a generally expressed conviction that these difficulties were in no way insurmountable.

The English sovereign contains 123.274 grains troy, including one-twelfth of alloy; that is to say, 113.002 of fine gold, equivalent to a weight in French grams of 7.322.

A gold piece of 25 francs would contain 7.258 grams of pure gold, besides one-tenth of alloy, representing a difference in favor of the Eng-

lish coin of 0.064, or 64 milligrams, and an excess of pure gold in the English over the French coin of .825 per cent., equal to, as nearly as possible, 20 centimes, or, speaking roundly, 2*d.*

The process of assimilation would, therefore, consist in diminishing the value of the pound sterling by 2*d.*, and substituting for the present sovereign a coin (reduced in fineness to .900) which would exactly correspond in value with the proposed French gold piece.

The mode by which the process might be effected was freely debated, and opinions were expressed that the existing sovereigns might be maintained in circulation by taking advantage of the loss of weight by wear allowed by law, and which permits a divergence of .774 grains, or .628 per cent. (1½*d.* nearly) from the exact weight; but we felt it our duty to declare our opinion that such an expedient would be considered inadmissible in England, and that we were satisfied that so essential a change could only be carried out at the cost of a recoinage of our whole gold currency, variously estimated at from £80,000,000 to £120,000,000.

It was allowed that the sovereign might continue to be divided as at present, into 20 shillings; but it is obvious that, unless the sovereign were divided into 25 francs, small progress would be made towards a general unification of coinage. Now the division of our pound into 25 would be found inconvenient in circulation, and would soon lead, in all probability, to the issue of a 20-franc piece to supersede the former.

We do not feel called upon in the present report to enter into any discussion upon this question, which would doubtless form the subject of serious consideration hereafter, should her Majesty's government determine to institute an inquiry into the possibility of associating this country in the system of international coinage recommended by the Paris conference.

We confine ourselves to reporting the earnestness with which the proposition above mentioned was pressed upon our attention, and with which the hope was expressed that it would be made the subject of mature consideration by her Majesty's government.

Our attention was directed to a small variation in the weight of the sovereign proposed upon other grounds. It is well known that all gold brought to the mint is returned in the form of sovereigns without deduction or charge; and there is no doubt that our practice is correct in principle for the metal which, like gold, is adopted as the measure of value. But it is at the same time undeniable that some additional value is imparted to the metal by the work applied to it in coining, and a small charge to cover, or partially cover, the mint expenses is on that account generally imposed upon coin in the countries of the continent, under the name of *brassage.* In France the charge thus borne by the holders of bullion amounts to 6 francs 70 centimes on a kilogram of gold, which is coined into 155 Napoleons, or 3100 francs, being equivalent to 4.32 centimes on a 20-franc piece. The system of free mintage has also, since 1853, been abandoned in the United States, where, in addition to the

charge for refining, a charge of one-half per cent. (50 cents on $100) is now taken upon all gold brought for conversion into coin. A small mint charge does not appear to be complained of anywhere. The charge acts usefully for the preservation of the coin, by removing any inducement to melt it down for any ordinary technical purpose, or even to supply bullion to foreign mints. We have reason to fear, from what we learned from professional members of the monetary conference, that the British gold coinage is liable to suffer heavily in this way. London is the entrepôt for the precious metals from which other countries draw their supplies. Now, gold may be procured from London either in the form of bars or sovereigns, at the same price; while to the foreign purchaser, if a mint contractor, sovereigns offer the following advantages: The assay may be safely relied upon, the gold is already alloyed with copper, and, more than all, the suitability of the metal for coining is insured. Further, sovereigns are taken by number, and the aggregate weight may be as nearly as possible correct. But that is not true of the weight of individual pieces, which, from the unavoidable imperfection of manufacture, are some heavy and some light within a certain small range, recognized as the tolerance in coining. There is reason to believe that large masses of new British sovereigns are occasionally treated so as to separate out the heavy pieces, and these are disposed of as bullion; while the lighter pieces, which may still be all of legal weight, are preserved and put into circulation. This fact will not surprise those persons who are aware of the small margin of profit upon which bullion transactions are often conducted.

A small mint charge on the British sovereign thus appears to be called for, as the necessary means of the preservation of the coin, while the measure is further recommended as an equitable re-payment to the country of the cost of coinage.

Although this question of the introduction of a mint charge into our system of coinage was only incidentally considered by the conference, we have thought it desirable to mention it somewhat prominently, in consequence of the notice which it has occasionally attracted in this country, and the importance which it would doubtless assume as an element of discussion in the consideration of any scheme involving a re-coinage of the gold currency.

We must state that the adoption of the 25-franc piece was warmly supported by Mr. Ruggles, the representative of the United States, who informed the conference that his government attached much importance to the coinage by France of pieces of that denomination.

Mr. Ruggles made the important statement that the United States were prepared to re-coin the whole of their gold, with a view of remodelling their system upon the basis of the convention of December, 1865; and that notwithstanding the serious loss which such a proceeding would entail, involving a diminution of no less than three per cent. in the value of their gold circulation, a far greater proportion than that involved in

the proposed conversion of the English sovereign, they looked to no reciprocal advantage beyond the coinage of a 25-franc piece, which would exactly correspond with the half eagle.

7. Considerable difference of opinion was expressed upon the proposal that a piece of 15 francs should be included in the recommendations of the conference. The object of the suggestion was to secure the creation of a coin nearly identical in value with 7 florins of Holland or South Germany, and 4 thalers of Prussia, as an inducement to those countries to adopt a coin representing denominations of their own currency, but which would be interchangeable with a French 15-franc piece.

In common with several of our colleagues we abstained from voting upon this question, respecting which no final decision was taken.

8. Having thus enunciated principles for the construction of an international monetary system, the conference added an expression of their opinion that it would be convenient, and in accordance with the idea of union sought to be established, that the governments of such states as might decide an introducing modifications in their system of coinage based upon on adoption of those principles should, as far as possible, make any measures to be taken for that purpose the subject of diplomatic conventions.

9. At the final meeting of the commissioners, his Imperial Highness Prince Napoleon, the president of the congress, expressed to them the anxiety of the French government for a practical and early realization of the scheme embodied in the recommendations of the conference, and encouraged them with considerable earnestness to communicate to their respective governments the hope which the imperial government entertained that in those countries whose circumstances might render their immediate or complete adhesion to the proposed system impossible, some inquiry might, at all events, be forthwith instituted for the examination of its merits and of its adaptability to their own systems and their own peculiar requirements.

His Imperial Highness accordingly proposed that an early date should be fixed by which the several governments should be invited to come to some decision as to the course which they might consider it advisable to adopt, and that their views should be then communicated to the French government, who would examine, upon a review of the several opinions expressed, whether a further combined consideration of the question would be desirable.

We expressed our disinclination to indicate any fixed period within which it could be expected that the English government would be able to announce a final decision upon so difficult and momentous a question, but stated that in the event of the feeling of the conference being in favor of accepting the suggestion of the president, we could only desire that a sufficiently long delay should be named to admit of Parliament having an opportunity, should it think proper to do so, of discussing and pronouncing an opinion upon the subject. With this view we suggested

the 1st of June, 1868, as a date by which her Majesty's government might possibly be in a position to make some official communication of their views and intentions.

The anxiety, however, expressed by Prince Napoleon for an earlier consideration of the matter, was shared by the majority of the conference, who fixed the 15th of February, 1868, as the date by which the governments should be invited to make known their intentions to the government of the Emperor.

It will be for her Majesty's government now to determine whether any special inquiry should be established into the results of the deliberations of the conference, and, if so, what form the inquiry should assume.

Your lordships will, no doubt, consider that such an investigation is properly due to the intrinsic importance of the question, as well as to a consideration of deference to the earnest interest with which its development from theory to practice has been advocated by the French government, under whose auspices the conference was assembled, and which has expressed so cordial a desire for the further co-operation of this country.

The appointment of a royal commission was made February 18, 1868, by the Queen. The commission had power to call before it, or any five members, such persons as are regarded as "better informed of the truth in the premises," and was required to report in writing, as soon as reasonably could be, the proceedings and opinions.

This commission reported on the 25th of July, 1868,[1] adversely to the reduction of the value of the pound to that of 25 francs, and also to the adoption of a gold coin of the value of 25 francs, to be substituted for the sovereign. The report says: "The reduction of the value of the pound would disturb all existing obligations and would cause many and serious difficulties;" and further, that "the measure is, after all, only a partial measure; and although advocated by some witnesses as good in itself, and as a step to further assimilation, the objects sought for by the witnesses connected with the trade and with the scientific bodies of this country would not be fully attained by anything less than a complete assimilation of the currencies of different countries."

"Several witnesses who took this view deprecated any change unless a complete assimilation of currency of moneys of account as well as of coins was made."

VIEWS OF M. CHEVALIER.

At the conclusion of the reading of the report by Baron de Hock at the third sitting, June 27, 1867, M. Michel Chevalier offered some observations on propositions four and five. He expressed the opinion "that the monetary unit should only be a branch of the general weights and measures, which is the metric system, the essence of which was to

[1] *Vide* Blue Book—Report from the Royal Commission on International Coinage, together with the minutes of Evidence and Appendix.

have the whole subordinate to the metre. The coinage ought not to stand on an independent basis," and, notwithstanding the accidental and happy circumstance that the most important monetary unit may be adapted to the piece of five francs in gold by means of very small changes, he considered that it would be best to change radically all the monetary system, and to adopt everywhere as a unit a weight of gold of 5 or 10 grams at .910 fine. The speaker was convinced that the English, faithful guardians at all times of the fineness of their coins, would refuse to lower the pound sterling to 25 francs.

M. ZEER HERZOG was in favor of accepting the piece of 5 or 10 grams if he had any hope that it would become the universal coin; but experience has shown that monetary units are not artificially created. The franc owes its easy adoption to its similitude to the ancient *livre tournois*, and the attempt made in Germany, in 1857, to create a common gold coin of a metric weight has proved a complete failure.

M. MICHEL CHEVALIER said that it was doing injustice to human intelligence to think that it was incapable to abandon old habits, but in reality we would return to the old practice by giving back to money its true significance, an exact weight, as the words *pound* and *marc* prove.

The views of M. Chevalier were further expressed in a letter to the Journal des Debats in which he discussed the monetary question then before the International Conference. That discussion was cited as follows by the Paris correspondent of the London Economist:

"He admits that, though there is much to be said in favor of the French one franc piece in silver, there is no chance of a silver standard being adopted, 'gold having,' he says, 'obtained the preference of the greatest number of States. The English,' he continues, 'are very determined on this point; they will have gold pieces, nothing but gold. Silver, with them, is only employed to make up sums, and silver pieces are of a nominal value superior to their real one. The Americans appear to be not less determined in favor of gold pieces; and Portugal has the same sentiment.'

"Having said this, he shows briefly the objections, scientific and practical, to maintaining both silver and gold standards, inasmuch as it is impossible to keep up a fixed proportion in the value of the two metals. Then he examined the proposition which has been made to reduce slightly the value of the English sovereign (by about 2*d.*) and the United States five-dollar gold piece, in order to make them equal to 25 francs French, and to coin 25-franc gold pieces in France. But he doubts that the English would consent to such a measure. 'They are rigorous,' says he, 'on the chapter of money. They shrink from no sacrifice to maintain their money perfectly intact; they make it a point of honor so to do, and they are right.' Besides, he doubts that the French gold coin, which is now of 20 francs, with subdivisions of 10 francs and 5 francs, 'possesses a character which imposes it on the adoption of other nations.'

"And these are his reasons: 'The metrical system is now in favor everywhere. But unfortunately the French gold piece is out of the pale of the metrical system. In respect to this system, a piece like that of 20 francs, which weighs 6.451 grams and an indefinite fraction, is as absurd as the pound sterling, the gold dollar, the eagle, or half-eagle, the doubloon, the German crown, and any other gold piece which circulates. The English are as much justified in recommending for universal unity the pound sterling, or the Americans the dollar, or the Spaniards the doubloon, as the French are in recommending the 5-franc piece, or the 20-franc piece, or the 25-franc piece in gold.' The great economist therefore advises that *from respect for the metrical system, the French should abandon their gold pieces.*

"He observes that by so doing they would prove the reality of their faith in that system, 'faith without works being dead.' Nevertheless, he does not deny that if the International Commission should resolve on placing the English pound sterling, the United States half-eagle, the imperial of Russia, and an Austrian gold piece of 10 florins, on a level with a French gold coin of 25 francs, it would be a progress compared with the existing state of things. 'We, however,' he adds, 'should feel regret at the reform not being made more complete and more rational—at stopping half-way when it was possible to go the whole distance. Modern nations,' he remarks in conclusion, 'like progress so much that they may confidently be called on to make an effort when an important and definitive amelioration has to be effected.'

From the above it appears that leading political economists of France were earnestly averse to the recommendation of the international committee of the Paris Exposition in favor of the substitution of the weight of the French five-franc piece of gold for that of the United States gold dollar. Their opposition was based on the *unmetrical* character of the proposed monetary unit.

OPINIONS EXPRESSED IN THE UNITED STATES.

The views of Mr. Ruggles in respect to the coinage of a 25-franc piece have not found ready acceptance by the scientific men of the United States who have given the subject thoughtful investigation. The great objection to the system of unification proposed by Mr. Ruggles is that it is not metrical—in other words, that the coins of the denominations and values proposed do not have simple relations as to weight with the gram, which is the unit of weight of the French metrical system.

The gold coin of France is not metrical; it has no simple relation to the metric unit of weight. In changing the coinage of the world, metrical unity is one of the first considerations. If we first obtain metrical harmony, unification of coins will follow. The gold coin of the United States is much more nearly metrical than the gold coin of France. The three-dollar gold piece of the United States weighs 5.015 grams, and the

other coins are in proportion. By reducing the weight this small fraction, and making the three-dollar coin weigh exactly five grams, a simple metrical relation will be established. The German crown has an exact simple relation; it contains 10 grams of pure gold.

The silver coin of France has simple relations to the gram, and is therefore metric. The ratio of value of silver to gold adopted by France (viz., 15½ to 1) is an undesirable one; it causes silver coin to be underrated, instead of being overvalued, as it should be, it being above the average market rate, (15⅜,) for the past 14 years, or since the discovery and working of the rich gold regions of California and Australia. The ratio of 15 to 1 originally adopted for the coinage of the United States in 1790 is a more satisfactory ratio, being below the market rate during the past 150 years, and being very simple for purposes of computation.

PETITION TO CONGRESS FROM THE AMERICAN STATISTICAL ASSOCIATION.

The petition of the American Statistical Association, adopted at its meeting in Boston in the year 1867, and presented in both houses of Congress, respectfully asks attention to the following propositions, and requests that the principles involved in them may be incorporated in any law that may be adopted in respect to the metrical system of weights, measures, and coins:

First. That the American Statistical Association earnestly favors the speedy practical adoption by the people of the United States of the metrical system of weights and measures; the system of which the metre, the litre, and the gram are respectively the units of length, of capacity, and of weight, and the use of which, by act of the last (the 39th) Congress, has been rendered permissible in the United States in the making of contracts, and has been necessitated by the requirements of several branches of industry.

Second. That our coinage should have simple relations as to weight with the unit of weight of the metrical system, the gram.

Third. That the standard as to fineness of our coinage, whether of gold or silver, should continue as now, nine-tenths of fine metal to one-tenth of alloy.

Fourth. That in the opinion of this association no widely-extended and permanent uniformity as to coinage can be secured through the adoption by our government of any system which is in conflict with the principles above mentioned.

Fifth. That the weight in grams and the fineness of the coins hereafter to be issued should be legibly stamped thereon prior to issue.

Sixth. That the changes required for converting our existing coinage into a metrical one are so slight that the recoinage of the existing coins of the United States would be unnecessary; that the difference between the existing coinage and that proposed, especially as regards gold coins of less denomination than $10, is very considerably less than the devia-

tion now allowed to the mint, which is one-fourth of a grain for the gold dollar and the quarter eagle, and one half of a grain for the half eagle, the eagle, and the double eagle.

Seventh. That, in pursuance of the foregoing, the gold dollar should contain $1\frac{1}{2}$ grams of fine gold, or its equivalent, $1\frac{2}{3}$ grams of standard gold, (nine-tenths fine,) and that other gold coins should be in proportion.[1]

Eighth. That the silver half dollar and the smaller silver coins hereafter to be issued should contain of fine silver at the rate of $22\frac{1}{2}$ grams to the dollar, or their equivalent, 25 grams of standard silver, (nine-tenths fine.)[2]

Ninth. That the gold coinage, as above described, should be made legal-tender in payment of sums of all amount; and that the silver coinage should be subsidiary, and admitted as legal-tender to an amount not exceeding $10 in any one payment.[3]

REPORT OF SENATOR SHERMAN.

In the Senate of the United States, June, 1868, Mr. Sherman made the following report,[4] to accompany Senate bill No. 217:

"The following documents have been referred to the Committee on Finance:

"1st. S. 217, in relation to the coinage of gold and silver.

"2d. S. 412, to promote uniformity of coinage between the moneys of the United States and other countries.

"3d. The proceedings of the International Monetary Conference, held at Paris in June, 1867.

"4th. The report of Samuel B. Ruggles, esq., delegate from the United States in the International Monetary Conference at Paris, November 6, 1867.

"5th. Sundry memorials relative to changes in our system of coinage.

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[1] The weight of the existing gold dollar, when new, is slightly (only about three-tenths of one per cent.) in excess of the proposed metrical dollar, the former containing of fine gold 1.505 grams, or of standard gold (nine-tenths fine) 1.672 grams; an excess of about 5-1000ths of a gram, or 8-100ths of a grain, and which is about one-third of deviation allowed the mint.

[2] The existing legal-tender silver 5-franc piece of France contains 25 grams of standard silver, (nine-tenths fine,) or $22\frac{1}{2}$ grams of fine silver, the same as herein proposed. Our existing fractional and subsidiary silver coins are somewhat smaller than the above, about one-half of one per cent., containing of standard metal at the rate of 24.86 grams to the dollar, instead of 25 grams, the difference being inconsiderable.

[3] It will be observed that the proposed silver coinage has precisely 15 times the weight of the proposed gold coinage of the same denominations. The market equivalent is, and for the past 60 years has been, greater than this, the value of gold relatively to silver having averaged for the past 14 years $15\frac{2}{3}$ times that of silver. Hence, by the above propositions, silver is overvalued, as, according to the experience of all commercial nations, it should be. But, to prevent the silver from driving the gold from circulation, it is necessary, as proposed, that the silver should be legal-tender only in payment of sums of small amount. The limit in the United States is now five dollars; in England 40 shillings, (about $10.)

[4] Senate report No. 117, 40th Congress, second session.

"These documents present to the Committee on Finance the interesting question of international coinage, and in considering them we necessarily inquired:

"1st. Whether the object proposed was of sufficient importance to justify a change in the coinage of the United States.

"2d. Whether the plan proposed by the Paris conference was the best mode to accomplish the end desired.

"3d. What legislation was necessary on the part of the United States to adapt our coinage to the plan proposed.

"4th. What provision should be made for existing public and private contracts.

"Your committee, after a partial consideration of these questions, direct that the bill first named be reported with amendments, supported by the following report, and that Mr. Morgan, of the same committee, be authorized to submit a report adverse to the bill, and that these reports be printed, and that the bill be postponed until next session, with a view to elicit a fuller discussion by the people of the several questions embraced in the bill.

"The importance of a common monetary standard among commercial nations has always been conceded. It has been the hope of philosophers and statesmen and the demand of writers on political economy for centuries, but has been as strongly opposed by the jealousies of locality and the interests of rival nations. Commerce and peace have steadily approximated different standards of exchange towards each other, while local interests and war have as steadily diverged them from each other. In all ages local and generally despotic authority has endeavored to make more money out of a given amount of gold and silver by clipping or alloy, while the general laws of trade and commerce have soon after reduced the current value of the money as it was reduced in weight and fineness. Formerly, not only each nation, but each province, duke, bishop, or municipality, made its own separate and distinct coin, often of the same name but different values. The effort to unitize the different moneys of a nation was but a part of the process by which the modern nations of Europe have been formed, and in this process the original money was debased in a remarkable way. The pound sterling of England was, at the time of William the Conqueror, equivalent to a pound weight of silver. It is now 3 oz. 12 dwt. 16 grs. The German florin was originally a gold coin, worth about $2 40. It is now a silver coin, worth about 40 cents. The French livre originally contained a pound of silver, worth about $18 50. It is now worth about 19 cents. The Spanish maravedi in the year 1220 was worth $3 20 of our money. It is now worth about a quarter of a cent. The result of these changes has been to secure to all parts of each leading nation a common unit of money—of fixed value. The pound sterling is the unit in Great Britain; the franc in France, Italy, Switzerland, and Belgium; the florin in South Germany; the thaler in North Germany; the dollar in the United States,

and various other units in other nations. These units are purely arbitrary, based upon local law, and diverse in weight, value, and alloy. They are, in some nations, of gold only; in some, of silver only; and in some a compound standard of gold and silver, and differing materially in the amount of alloy, and in the relative value of the two metals.

"For local purposes it is not very material which metal is the standard nor of what weight and fineness the standard may be, if only it is of fixed and invariable value, for the value of property and all internal commerce adapts itself to the intrinsic value of the gold and silver in the prescribed standard.

"The inconvenience of different standards of value arises mainly in foreign commerce, in the exchange of commodities among nations. The intercourse between modern Christian nations is now more intimate and exchange more rapid than it was between provinces of the same country 200 years ago. The annual trade between the United States and Great Britain is now greater in bulk and value than the aggregate annual trade between all the nations of Europe 200 years ago. The same reasons for adopting an international standard of value now exist as induced the American colonies, less than 100 years ago, to abandon their diversified standards of value, and adopt as a common unit the American dollar. Every advance toward a free exchange of commodities is an advance in civilization. Every obstruction to a free exchange is born of the same narrow despotic spirit which planted castles upon the Rhine to plunder peaceful commerce. Every obstruction to commerce is a tax upon consumption; every facility to a free exchange cheapens commodities, increases trade and production, and promotes civilization. Nothing is worse than sectionalism within a nation, and nothing is better for the peace of nations than unrestricted freedom of intercourse and commerce with each other. No single measure will tend in this direction more than the adoption of a fixed international standard of value, by which all products may be measured, and in conformity with which the coin of a country may go with its flag into every sea and buy the products of every nation without being disconcerted by the money changes.

"This has been the wish of American statesmen since the revolutionary war. The Spanish milled dollar was adopted as the basis of our coinage before the Constitution was framed, and with the hope, expressed by Mr. Jefferson, that it would lead to an international unit. Mr. Hamilton and Mr. Gallatin each desired the same result, but the French war postponed all efforts in that direction. Mr. John Q. Adams, in his remarkable report to Congress of February 22, 1821, upon the kindred but more comprehensive subject, 'the uniformity of weights and measures,' says:

"'This system approaches to the ideal perfection of *uniformity* applied to weights and measures, and, whether destined to succeed or doomed to fail, will shed unfading glory upon the age in which it was conceived and upon the nation by which its execution was attempted and has in part achieved.

"'If man upon earth be an improvable being; if that universal peace, which was the object of a Savior's mission, which is the desire of the philosopher, the longing of the philanthropist, the trembling hope of the Christian, is a blessing to which the futurity of mortal man has a claim of more than mortal promise; if the spirit of evil is, before the final consummation of things, to be cast down from his dominion over men and bound in the chains of a thousand years, the foretaste here of man's eternal felicity, then this system of common instruments to accomplish all the changes of social and friendly commerce will furnish the links of sympathy between the inhabitants of the most distant regions; the metre will surround the globe in use as well as in multiplied extension, and one language of weights and measures will be spoken from the equator to the poles.'

"Several efforts have been made by negotiation to secure uniformity of coinage, especially with great Britain.

"In 1857, in compliance with an act of Congress, passed upon the report of the Committee of Finance of the Senate, Professor Alexander was sent as a special commissioner to that country to secure a unity of coinage between the two countries, but, after various conferences, the mission failed from an indisposition of the English government to modify their pound, shilling, and pence.

"In his report of December, 1862, Mr. Secretary Chase invited the attention of Congress to the importance of uniform weights, measures, and coins, and recommended that the half eagle of the United States be made equal to the gold sovereign of Great Britain in weight and fineness.

"The Berlin International Statistical Congress, held in 1863, composed of representatives of 14 countries, and at which the United States was ably represented by Mr. Ruggles, agreed to the following resolution:

"'1st. That the Congress recommends that the existing units of money be reduced to a small number; that each unit should be, as far as possible, decimally subdivided; that the coins in use should all be expressed in weights of the metric system, and should all be of the same degree of fineness, namely, nine-tenths fine and one-tenth alloy.

"'2d. That the different governments be invited to send to a *special congress* delegates, authorized to consider and report what should be the relative weights, in the metrical system, of the gold and silver coins, and to arrange the details by which the monetary system of different countries may be fixed according to the terms of the preceding propositions.'

"This led to the recent Paris conference and to the adoption by Congress, in 1866, of several measures for the use of the metric system of weights and measures. At the Paris conference 19 nations were represented, governing a population of 320,000,000 European and American, and 190,000,000 Asiatic.

"The conference agreed with great unanimity upon the plan hereafter

stated, and the delegates from the United States were active and influential in harmonizing conflicting views and in securing the result arrived at. Upon the first part of their inquiry, your committee therefore conclude that the object proposed is of the highest importance, constantly sought for at every period of the government, and that the United States is fully committed to its support if the plan proposed is practicable and just.

"Aside from the general advantages which we will share with the civilized world in attaining a uniform coinage, there are special reasons why the United States should *now* adopt the system.

"The United States is the great gold-producing country of the world, now producing more than all other nations combined, and with a capacity for future production almost without limit.[1] (See reports of Mr. Ruggles and J. Ross Browne.) Gold with us is like cotton, a raw product. Its production here affects and regulates its value throughout the world Every obstruction to its free use, such as the necessity of its recoinage when passing from nation to nation, diminishes its value, and that loss falls upon the United States, the country of production.

"2. The United States is a new nation, and therefore a debtor nation. By placing ourselves in harmony with the money units of creditor nations, we promote the easy borrowing of money and payment of debts without the loss of recoinage or exchange, always paid by the debtor. This is necessarily so where the debt is payable abroad, and if payable here the creditor discounts the exchange and difference in coinage in advance.

"3. The technical rate of exchange between the United States and Great Britain, growing out of the different nominal values of coin, is a standing reproach which can only be got rid of by unifying the coinage of the two countries, when both the real and technical rate of exchange will be at par with only such slight variations as will indicate the course of trade.

"4. Gold is now demonetized as a currency, and the great bulk of it in the United States is now held in the treasury, so that it is not possible to select a time when this great international change of coinage could affect the interests of our people less. From inquiries made of the officers of the mint we find that the cost of reminting the present coin would be less than one-twentieth of one per centum. The fineness of the proposed coin being the same as the old, there would be no assay, and the cost of the change would not be perceptible to the holder of the coin, and scarcely so to the government.

"The second inquiry of your committee was whether the plan proposed by the Paris conference was the best mode to accomplish the end desired.

"It proposes:

"1. A single standard, exclusively of gold.

"2. Coins of equal weight and diameter.

"3. Of equal quality or fineness—nine-tenths fine.

[1] Upon these points the foregoing pages of this report and the tables of production in Chapter viii may be consulted.—W. P. B.

"4. The weight of the present five-franc gold piece to be the unit.

"5. The coins of each nation to bear the names and emblems prepared by each, but to be legal tenders public and private in all.

"1. The single standard of gold is an American idea, yielded reluctantly by France and other countries, where silver is the chief standard of value. The impossible attempt to maintain two standards of value has given rise to nearly all the debasement of coinage of the last two centuries. The relative market value of silver and gold varied like other commodities, and this led first to the demonetization of the more valuable metal, and second to the debasement or diminution of the quantity of that metal in a given coin. In a short time the cheaper metal would by a diminished supply become the dearer metal, and then it would be debased and cheapened in the same way. This process repeatedly occurred in Europe, and has twice occurred in the United States within the life of the present generation. By the act of June 28, 1834, our gold coin was reduced from 270 grains of standard gold to 258 grains, or 4.4 per centum, in order to make it correspond with the market value of silver. In consequence of the discovery of gold in California that metal was cheapened, and silver became relatively more valuable and was hoarded or exported. To avoid this the weight of our silver coin was reduced by the act of January 21, 1853, from 206 grains of standard silver to 192 grains, or 6.7 per centum.

"This subject early excited the attention of financiers. Mr. Gorham, in his report of May 4, 1830, as Secretary of the Treasury, forcibly says:

"'Amidst all the embarrassments which have surrounded this subject since the adoption of metallic standards of property, it is remarkable that governments have so tenaciously persevered in their effort to maintain standards of different materials, whose relation it is so difficult to ascertain at any one time, and is so constantly changing; and more especially when a simple and certain remedy is within the reach of all. This remedy is to be found in the establishment of one standard measure of property, only. The evil of having two or more standards arises, as already observed, from the impossibility of so fixing their relative values by law that one or the other may not, at times, become of more value in market than estimated by regulation; and, when this happens, it will be bought and sold according to its market value, regardless of the law.

"'The proposition that there can be but one standard in fact is self-evident. The option of governments charged with this duty is therefore between having property measured sometimes by gold and sometimes by silver, and selecting that metal which is best adapted to the purpose for the only standard. Why the latter course has not been universally adopted it is not easy to explain, unless it may be attributed to that prevalent delusion which seeks to secure the possession of gold and silver by restraining their exportation, and avoiding the payment of debts rather than improving the public economy by giving every facility to it.'

"The opportunity is now offered to the United States to secure a con-

mon international standard in the metal most valuable of all others—best adapted for coinage, mainly the product of our own country, and in conformity with a policy so constantly urged by our statesmen, and now agreed to by the oldest and wealthiest nations of the world. Surely we should not hesitate for trifling considerations to secure so important an object.

"The equal weight and diameter of coins will guard against adulteration and counterfeiting, and will familiarize our people with the metric system of weights and measures. This system is already used in some of our coins, and is permitted by our laws, and will, by gradual means, become adopted as the only international system.

"The provision made that each nation shall retain its own emblems, will not impair the ready currency of coin, but will induce care in coinage. The fineness proposed is the present standard of the United States—an important consideration in recoinage, as no new assay will be required.

"All the provisions of the plan proposed are in harmony with the American system of coinage. They are either already adopted or may be without inconvenience. The only point upon which a diversity of opinion may arise is as to the unit of value, and here the chief difficulty was not as to what particular quantity of gold was the best unit, but upon what quantity all the nations represented could agree. The unit recommended is the existing 5-franc gold piece, 620 of which weigh a kilogram.

"For the reasons that induced the adoption of this unit of value, reference is made by your committee to the report of Mr. Ruggles. They may be summed up as follows:

"1. The coin proposed is the smallest gold coin in use, and therefore the most convenient unit of value.

"2. It approximates more nearly to existing coinage of the great commercial nations than any other proposed. The dollar reduced 3½ cents at the mint becomes the unit of value, and its decimal divisions and multiples enable us to retain all our well-known coins, both of gold and silver.

"A very slight reduction of the English sovereign makes it conform to the multiple of the dollar and franc, so that five francs are a dollar, and five dollars are a sovereign, or a half-eagle. The same unit is easily adapted to existing coinage of other nations.

"3. The franc is already in use by 72,000,000 of the most industrious and thrifty people of Europe—France, Belgium, Italy, Switzerland, and Holland.

"4. The actual gold coinage in francs from 1793 to 1866 was $1,312,220,814, while the gold coinage in dollars during the same period was $845,536,591, and in sovereigns was $935,341,450, thus showing that in France alone the existing gold coinage on the proposed standard is greater than upon any other that could be adopted.

"It must be remembered that the great body of our coin and bullion has been exported, and is now in foreign coin; that a large part of the balance is held in the treasury, and that less gold is in actual circulation in

the United States than in any other great commercial nation. It is unreasonable, in view of these facts, for the United States to demand that our dollar, composed of 1671.50 milligrams of gold, should be the standard of value. As the nation most interested in international coinage, we should be ready to yield something to secure that object. By the plan proposed we yield nothing except the very small reduction of the weight of our standard, and without any other change in our coins, multiples, divisions, devices, or alloy.

"5. France, whose standard is adopted, makes a new coin similar to our half-eagle. She yields to our demand for the sole standard of gold, and during the whole conference evinced the most earnest wish to secure the co-operation of the United States in the great object of unification of coinage. Her metric system is far the best yet devised and is in general harmony with our own, while Great Britain has refused even to negotiate with us for unity of coinage, and maintains the most complex system of weights, measures, and coinage now in use among Christian nations. The decimal system, the basis of all our computations, she rejects, and adheres to the complex division of pounds, shillings, and pence, which we rejected with colonial dependence.

"These reasons induce your committee to earnestly urge the adoption by the United States of the general plan of the Paris conference.

"What legislation is necessary on the part of the United States to adapt our coinage to the plan proposed?

"On this point your committee have consulted the Secretary of the Treasury and the director of the mint. The bill herewith reported is the result of this conference, and is all that is needed to secure the object proposed. The provisions in regard to silver coinage are urged by the director of the mint to secure harmony between the present market value of gold and silver; but this coinage can be regulated hereafter by the varying values of the two metals and without disturbing the sole legal standard of value for large sums. The general provisions of existing law relating to coinage are preserved.

"What provisions, if any, should be made for existing contracts? Shall they be discharged in the money made a legal tender at the date of the contracts or in the money provided for by this bill?

"In determining this question, a distinction must be made between public and private debts. All private contracts are made in view of the power of Congress to regulate the value of coins. This power has been repeatedly exercised by Congress, and in no case was any provision made for enforcing existing contracts in the old rather than the new standard. All property and contracts may be affected by legislation, but it is not presumed that in the exercise of its legislative power Congress will be controlled by either the debtor or creditor, but only by the general good. To continue a distinction between the old and the new coin in the payment of private debts would result in great inconvenience, while making the new coin a legal tender for all debts after a reasonable time

would enable our citizens to conform the great body of their contracts to the new standard. Such has been the practice not only in the United States but in other countries, where from time to time the standard of coin has been changed. Such was the principle adopted in the passage of the present legal-tender act, which if made applicable only to future contracts would have bankrupted a large portion of the active business men of the country, whose business compelled them to contract debts.

"It must be remembered that all private debts are now on the basis of legal-tender notes, of far less intrinsic value than the proposed coin. The depreciation of legal-tenders had the effect to diminish the value of all debts and the property of all creditors to the extent of the depreciation, and is only justifiable by the highest considerations of national safety. The resulting process of returning to specie basis will be far more severe on the debtor class. The depreciation of the burden of debt is a loss to a class generally benefited by the increased value of fixed property, and better able to bear the diminution of their capital, but an increase of the burden of the debt to the debtor class, by the payment of coin instead of depreciated paper money, often produces absolute ruin without fault in the debtor. All contracts are now on the legal-tender basis. Every private creditor would now take the new coin, and would be largely benefited by the changed medium of payment. The small relief of the debtor by the slightly diminished standard of coin will tend to that degree to lessen the unavoidable hardship to him of a return to specie payment. This relief would be especially just on the payment of long bonds issued by railroads and other corporations during or since the war, which were almost uniformly sold for depreciated paper money. Your committee therefore conclude, that as to all private debts or contracts, the only provision necessary in this bill is to postpone the operation of its legal-tender clause for a reasonable time after the passage of the act.

"Does not a different principle prevail as to public debts? As to public debts, the contract of loan is the only law that ought to affect the creditor until his debt is fully discharged. Congress, as the authorized agent of the American people, is one party to the contract, and it may no more vary the contract by subsequent acts than any other debtor may vary his contract. As to the public creditor, no legislative power stands between him and the exact performance of his contract. Public faith holds the scales between him and the United States, and the penalties for a breach of this faith are far more severe and disastrous to the nation than courts, constables, and sheriffs can be to the private debtor. These penalties are national dishonor and inability to borrow money in case of war or public distress, and the ultimate result is the sure and speedy decline of national power and prestige. When changes in our coin were made in 1834 and 1853, the United States had no public debt of any significance, and the precedents then made do not apply to the present time. Now the public debt is so large that a change of 3½ per cent. in the value of our coin is a reduction of the public debt of $90,000,000. So much of

this debt as exists in the form of legal-tender notes will be received and disbursed as money, and as its value for some time will be less than the new coin no provision need be made for it, but for so much of the debt as is payable, principal or interest, in coin of a specific weight and value, provision ought to be made for its exact discharge in that coin or its equivalent in the new. Your committee, therefore, propose an amendment to that effect.

"Your committee have been led to inquire whether, if the United States adopt the plan of the Paris conference, it will be adopted by other nations so as to accomplish the object proposed, of an international currency, of universal circulation throughout the civilized world. Upon this point we have the most satisfactory assurances. Since the Paris conference it has been adopted by Austria, and will, in all human probability, be adopted by the North German Confederation. A strong party in Great Britain, including many of her ablest statesmen, and the great body of her commercial classes, has urged the adoption of the plan, even in advance of the United States, and they concur in the opinion that, if adopted by the United States, Great Britain will be induced by her interests to modify her sovereign to the international standard. We have the highest authority for saying that Canada stands ready to adopt the plan the moment it is adopted by the United States. Different representatives of the South American States say those States will readily adopt it; so that upon Congress now rests the fate of a measure that, according to the opinion of eminent American statesmen, will shed unfading glory upon the age of its adoption, that will give to international law an international coinage, and will lead to a vast extension of the objects of international law common to Christian and civilized nations, thus binding the whole family of man by the same ties that are uniting and consolidating neighboring states. Your committee recommend the adoption of this measure with certain amendments, with the conviction that it will not only promote the local interests of the United States, but will subserve the general interests of all the nations who have already or may hereafter join in its adoption."

REPORT OF SENATOR MORGAN.

Mr. MORGAN, from the Committee on Finance, United States Senate, submitted the following report, to accompany Senate bill No. 217:

"In June last, while the Universal Exposition was in progress, an international monetary conference was held in Paris, under the presidency of the French minister for foreign affairs. Delegates from the several European nations were present. Mr. Samuel B. Ruggles represented the United States, and his report on the subject has been communicated to Congress, through the Department of State. From this it appears that a plan of monetary unification was there agreed upon, the general features of which are:

"1. A single standard, exclusively of gold.

"2. Coins of equal weight and diameter.

"3. Of equal quality, nine-tenths fine.

"4. The weight of the present 5-franc gold piece to be the unit, with its multiples. The issue by France of a new coin of the value and weight of 25 francs was recommended.

"5. The coins of each nation to continue to bear the names and emblems preferred by each, but to be legal tenders, public and private, in all.

"Senate bill 217 is designed to carry into effect this plan. Its passage would reduce the weight of our gold coin of $5 so as to agree with a French coin of 25 francs. It determines that other sizes and denominations shall be in due proportion of weight and fineness; and that foreign gold coin, conformed to this basis, shall be a legal tender, so long as the standard of weight and fineness are maintained. It requires that the value of gold coins shall be stated both in dollars and francs, and also in British terms, whenever Great Britain shall conform the pound sterling to the piece of $5.

"It conforms our silver coinage to the French valuation, and discontinues the silver pieces of one dollar, and five and three cents, and limits silver as a legal-tender to payments of $10. The 1st of January, 1869, is fixed as the period for the act to take effect.

"The reduction which this measure would effect in the present legal standard value of the gold coin of the United States would be at the rate of $3 50 in the hundred, and the reduction in the legal value of our silver coinage would be still more considerable.

"A change in our national coinage so grave as that proposed by the bill should be made only after the most mature deliberation. The circulating medium is a matter that directly concerns the affairs of every-day life, affecting not only the varied, intricate, and multiform interests of the people at home, to the minutest detail, but the relations of the nation with all other countries as well. The United States has a peculiar interest in such a question. It is a principal producer of the precious metals, and its geographical position, most favorable in view of impending commercial changes, renders it wise that we should be in no haste to fetter ourselves by any new international regulation based on an order of things belonging essentially to the past.

"Antecedent to any action by Congress on this subject we should carefully consider:

"I. The effect which the present abundant production of the precious metals, especially of gold, and the probable great increase in the supply, as mining facilities are improved and more generally applied, will have upon the purchasing power of these metals.

"II. The question of preserving such a relation between gold and silver as will retain the latter metal in free circulation, and continuance of the coinage of such denominations of silver as will serve to encourage American commerce with Mexico and with South American and Asiatic nations.

"III. The choice of a standard of unification which, all things consid-

ered, shall be least objectionable on account of fractional weights and intricacy of calculations.

"IV. Of delaying action until the Paris plan has been adopted by the commercial powers of Europe, and accepted by those nations on the western continent with whom we have commercial relations; or at least until their intentions in this regard are more fully known.

"V. Should not a period when the public mind is calm, more so than now, on the subject of monetary affairs, and when the national debt has become less formidable, be chosen for initiating a change?

"VI. The advisability of further popular discussion of the subject, to the end that the business as well as general public shall fully understand on what grounds so important a reduction in the value of our monetary unit, the dollar, is based, and the further advocacy of the merits of our own, so that, should any existing system be accepted, ours shall be more fully considered in that connection.

"Uniformity in coinage and also in weights and measures has been the pursuit of ages. Speculative systems have been advanced, only to be given up when subjected to practical tests, but the idea has never been abandoned. Nor was the recent occasion the first in which our government has been recommended, and that, too, with some urgency, three-quarters of a century ago, by the minister of that country, to adopt the French system of weights, measures, and coinage. But Congress, both then and since, has properly exercised great caution on a subject so full of complications. And the question of international unification yet remains an open one, balanced between the facilities it would afford to foreign commerce and the evils it would introduce into our domestic affairs. The adoption of some satisfactory and comprehensive plan, one to be adopted because it shall best subserve the interests of all, and not because it is or is not an existing one, may become desirable. If so, Congress will then be ready to take part in effecting such a measure. At present, however, there are questions of a very practical nature relative to the precious metals that begin to reveal themselves, and will soon press home upon us, which largely outweigh in importance the more theoretical one of assimilating all metallic circulations. Our situation as a commercial nation makes it prudent that on this, as on every question affecting home interests, we should remain free to mould our policy to meet occasions as they arise, following such course as shall appear best suited to develop our great, almost limitless, natural resources, increasing by gentle means the stream of commerce, but forcing nothing, rather than to hamper ourselves by international engagements or arbitrary regulations. An error now in fixing the values of gold and silver would injure this nation far more than any other. We may safely trust to the natural laws of commerce for the correction of any evils from which we have suffered. We have paid our seigniorage, we have met the demand for foreign exchange, but who shall say that the course of trade in the next ten years may not make an American city, New York

or San Francisco, the centre of exchange, and confer upon us the advantages so long enjoyed by European capital? Certainly no other nation can so well afford to wait.

"The movement proposed in the bill appears to be in the wrong direction. The standard value of gold coin should be increased—brought up to our own, rather than lowered. The reason must be obvious. Authorities unite in the conclusion that a fall in the value of the precious metals, in consequence of their rapidly increasing quantity, is inevitable. M. Chevalier recently estimated that the present yield of gold amounts, in 10 years, to about as much as the entire production during the 356 years which intervened between the date of the discovery of America and the year 1846, when the mines of California were found; and Mr. Cobden concluded that unless the cardinal rule of commerce, that quantity governs price, which applies infallibly to all other commodities, loses its force when gold is concerned, this continued and great increase must be followed by a reduction in its value.

"Ross Browne, in his recent report, says that the time is not far distant when the price of the precious metals, as compared with other proceeds of human labor, must fall. 'They are now increasing more rapidly than is the demand for them, and at the present rate of increase they would soon have to fall perceptibly; but the production will become much greater than it is. The vast improvements that have been made both in gold and silver mining, within the last 20 years, are applied only to a few mines. * * * If all the argentiferous lodes of Mexico, Peru, and Bolivia, known to be rich, were worked with the machinery used at Washoe, their yield would really flood the world. * * * New deposits of silver will be found, and innumerable rich lodes on the Pacific slope of the United States, not yet opened, will be worked with profit.'[1]

"The present enhanced prices of commodities and labor, the world over, measure, to some extent, the increasing quantity and consequent depreciation in the value of precious metals, and clearly indicate the direction the change is taking.

"The creditor, public and private, will be affected by this tendency, and while he must abide a depreciation which proceeds from natural causes, he may properly insist that artificial evils shall not be superadded.

"Of the increased production of gold the United States supplies more than half, and when the lines of railway now pushing across the continent shall penetrate the gold-bearing mountains and valleys of California and Oregon, and the western territories, mining improvements will be powerfully supplemented.

"The American continent, too, produces four-fifths of the silver of commerce. The mines of Nevada have already taken high rank, and Mexico alone supplies more than half the world's grand total. Our relations with the silver-producing people, geographically most favorable, are otherwise intimate. Manifestly our business intercourse with them can be

[1] See observations on this subject, Chapter viii.—W. P. B.

largely increased, a fact especially true of Mexico, which, for well-known political reasons, seeks the friendliest understanding. This must not be overlooked.

"These two streams of the precious metals, poured into the current of commerce in full volume, will produce perturbations marked and important. Other countries will be affected, but the United States will feel the effect first and more directly than any other.

"The Pacific railway will open to us the trade of China, Japan, India, and other oriental countries, of whose prepossessions we must not lose sight. For years, silver, for reasons not fully understood, has been the object of unusual demand among these Asiatic nations and now forms the almost universal medium of circulation, absorbing rapidly the silver of coinage. The erroneous proportion fixed between silver and gold by France, and which we are asked to copy, is denuding that country of the former metal. Our own monetary system, though less faulty, is not suitably adjusted in this respect. The silver dollar, for instance, a favorite coin of the native Indian and distant Asiatic, has well-nigh disappeared from domestic circulation, to reappear among the eastern peoples, with whom we more than ever seek close intimacy. As they prefer this piece we would do well to increase rather than discontinue its coinage, for we must not deprive ourselves of the advantages which its agency will afford, and 'it would be useless to send dollars to Asia inferior in weight and value to its well-known Spanish and Mexican prototype.'

"Mr. Ruggles says that nearly all the silver coined in the United States prior to 1858 has disappeared. A remedy is not to be found in the adoption of a system that undervalues this metal, for that commodity, like any other, shuns the market where not taken at its full value to find the more favorable one. It is a favorite metal, entering into all transactions of daily life, and deserves proper recognition in any monetary system.

"It is said that 'to promote the intercourse of nations with each other, uniformity of weights, coins, and measures of capacity is among the most efficacious agencies.' Our weights, coins, and measures now correspond much more nearly to the English than to the French standard. Our commerce with Great Britain is nine times greater than with France, and if the former does not adopt the Paris system of coinage—and we have no assurance that she will—the United States would certainly commit a serious error in passing this bill. No argument is needed to enforce this. And what of the rising communities? A properly adjusted coinage would stimulate commerce with those great parts of the continent lying south and southwest of us, with the West Indies, and the countless millions of trans-Pacific countries. We stand midway on the thoroughfare of traffic between these two widely-separated races. Our railways, canals, our natural highways, and merchant marine, may be made to control their carrying trade. But here, as everywhere else, a well-adjusted coinage becomes a wand of power in the hand of enterprise. Tokens are not wanting to mark the favor in which the United States are

now held in China. The usual honor recently conferred by that government upon a citizen of this country was not alone because of his fitness as an ambassador at large, but was a mark as well of a friendly disposition towards this country. Future harmony of intercourse is assured, too, by their adoption as a text-book in diplomatic correspondence of a leading American authority on international law. Much might also be said about the growing partiality of Japan towards this country; but it is enough that the recent opening of certain ports indicates an enlightened change in the policies of these two old empires, of which commerce, especially our own, is availing itself. There is nothing, indeed, in our foreign policy to create suspicion in the minds of the cautious statesmen of Asia. We are non-aggressive; our vast domain leaves no motive for conquest; but, on the other hand, our fertile, unpeopled territory invites settlers, and our mines and the demand for labor on the Pacific slope are rapidly drawing thitherward from Asia an increasing tide of emigration, aiding not only in peopling that region, but in establishing closer relations as well between individuals as a more liberal commerce between the nations.

"Referring to the third inquiry, it may be asked, should a new standard be adopted; is the French system more suitable for us than our own?

"Doubtless the French system 'embraces all the great and important principles of uniformity which can be applied to weights and measures, (and coins as well,) but it is not yet complete. It is susceptible of many modifications and improvements.' And it is not inconsistent with the respect held toward so exalted a power as France, briefly for us to examine somewhat more closely certain features of this question. We are producers; France, Belgium, Switzerland, and Italy, (who have adopted the system,) are non-producers of the precious metals, and, therefore, while adding little to the common stock of material for metalic currency, are not affected like us by an increase in gold and silver. Nor are they likely to be influenced as we are to be, by other coming changes. Neither is there anything in the financial or commercial status of France which entitles her monetary scheme to a preference over all others in fixing a common coinage, unless, in itself, it is superior to all others. This, in a practical sense, is not the fact. Writers represent it as surrounded with difficulties, and an eminent French author calls it 'the worst of all systems.' Its basis is arbitrary, and the ratio it observes between gold and silver—one of gold for 15½ of silver by *weight*, but one to 14 38-100 in *value*—is a confession of the erroneousness of the plan. In theory, her coinage is metrical, and yet it is said that France has not, nor never has had, a gold coin containing an even number of grams; or, practically, it is unmetrical.

"The bill proposes 1612.9 milligrams, or 24 89-100 grains, for the gold dollar. If adopted and we should still give to our silver dollar a weight and value equal to the Mexican dollar, 416 grains, we should establish a ratio of value of gold to silver of 16 7-10 to 1, while 15 to 1 is as

high as it would be safe to go, and where, indeed, our own standard places it. 'If we consent to reduce our gold dollar, as proposed by the Paris conference, to 24.89 grains, we could not possibly coin a silver dollar that would be of any use to us in commerce,' for we should increase rather than diminish the weight of the gold dollar.

"On the subject of the French monetary unit, Mr. Dunning, superintendant of the United States assay office in New York, a competent authority, says:

"'The present weight of the gold 5-franc piece is not justified by any scientific reasons better than the mathematical accident that 620 of them weigh exactly a kilogram, a circumstance which has not the slightest practical importance. The fact is, this fractional and inconvenient weight, which the world is invited to adopt, was not fixed upon by the French themselves by design, but as the unavoidable result of a false theory.'

"Further, that after having fixed the ratio of gold as 1 to 15½, and having adjusted the weight of their silver coins in integral numbers, they were compelled to accept for the 5-franc gold piece the interminable decimal resulting from the division of 25 grams by 15.5, viz: 1.6129032258064̄5. The awkwardness and inconvenience of this weight, he adds, 'can be best shown by giving the weight of a few of the gold coins of France, Great Britain, and the United States, as they will be if the proposed unit is adopted.' (See accompanying tables.)

"Mr. Dunning recommended for consideration a monetary unit of 1620 milligrams, for which he claims greater facility of making calculations than that proposed by the conference, and that it is also a compromise between the French and English coin weights, and would require a reduction on our own dollar of half a cent less than by the plan proposed in the bill. Mr. Dubois, assistant assayer of the Philadelphia mint, concurs in the views of Mr. Dunning.

"Other considerations aside, it may be said that until the leading nations represented at the Paris conference shall adopt a plan of unification, Congress may very properly decline to act; for anticipatory legislation, while disturbing relations existing between debtor and creditor, would accomplish no practical end. Mexico would not be partial to the French system, and Canada cannot be expected to accept it until its adoption by England. Unification to be desirable must be universal. Unless its advantages are palpable to commercial peoples of Europe, occupying contiguous territories, and whose intercommunication is constant, it cannot be of serious moment to us, to whom the change would be of but comparative usefulness.

"It has been urged as a reason for the early passage of a law to unify coinages, that commercial transactions with Europe would be facilitated thereby; and also that citizens of our country, in visiting Great Britain and the continent, would be spared losses and annoyances if we possessed uniformity. But it should be recollected that, in all large commercial transactions, gold coin is accounted by weight and not by tale—

a proceeding more speedy and equally just; and of the moneys used abroad by travellers from this country, probably more than 90 per cent. is carried in bills of exchange, a mode much safer and more convenient to the traveller, and which would be continued even if the bill became a law. The British delegates at the Paris meeting stated that, 'until it should be incontestibly demonstrated that the adoption of a new system offered superior advantages, justifying the abandonment of that which was approved by experience and rooted in the habits of the people, the British government could not take the initiative in assimilating its money with that of the nations of the continent.'

"A period of suspension of specie payment like the present, it has been stated, is a favorable one for inaugurating the change proposed by the bill. But the juncture is one marked by great differences of opinion in respect to the question of circulation, return to specie payments, and the public finances as a whole. A change in the value of coinage would but add to the embarrassments of the situation, and it may be remarked incidentally that the reduction of the legal value of the dollar would inure largely to the benefit of speculators in gold and hoarders of the precious metals, a fact that might seriously prejudice the measure in public estimation.

"If the nation were comparatively free from debt, Congress might with more propriety consider the question of changing the legal standard of coin; but one effect of reducing it as now proposed would be to deprive the public creditor of nearly $100,000,000 of his rightful due. In the estimation of the committee such a proposition ought not to be entertained by Congress. It is proper here to say, that the delegate, Mr. Ruggles, who favors unification, has at no time thought it just to lower the value of our coin without making proper allowance to the holder of the several forms of national obligations.

"To be acceptable a change in our coinage must be a thing of clearly obvious advantage and proceed from the people. There has, however, been no popular expression in favor of the proposed plan, nor, indeed, any voluntary action in that direction whatever on the part of financial men, either in this country or elsewhere. If there has been any complaint in regard to our monetary system, the fact has not come to the knowledge of your committee. On the other hand, certain scientific bodies in our country have already protested against any ill-considered change in the American dollar. Our coinage is believed to be the simplest of any in circulation, and every way satisfactory for purposes of domestic commerce; it possesses special merits of every-day value, and should not, for light reasons, be exchanged where the advantages sought to be gained are mainly theoretical, engaging more properly the attention of the philosopher than the practical man. The instincts of our people lead them to believe that we are on the eve of important business changes, and we may therefore safely hold fast for the present to what experience has proven to be good, following only where clear indications may lead, and a future of great prosperity opens to our country. The war gave us

self-assertion of character, and removed many impediments to progress; it also proved our ability to originate means to ends. Its expensive lesson will be measurably lost if it fails to impress upon us the fact that we have a distinctive American policy to work out, one sufficiently free from the traditions of Europe to be suited to our peculiar situation and the genius of our enterprising countrymen. The people of the United States have been quick to avail themseves of their natural advantages. The public lands, not only, and the mines of precious metals, but our political institutions, have likewise powerfully operated in our favor, and will continue to do so with increasing force.

"Unification of the coinage, like all similar questions, should be taken up without bias and considered on the broad ground of national interest. At the proper time, when the country is restored to a normal financial condition, and the public ask a change in this regard, it may be well to appoint a commission of experts, carefully to consider the question in its various bearings. Reflection and further observation here and elsewhere may suggest the foundations for a better and more enduring system than the one now proposed, which in the nature of things is but a provisional one. Permanency is equally important with uniformity in our coinage.

"John Quincy Adams, who spent several years in studying the question of uniformity in weights and measures, and incidentally in that of coinage—indeed, the latter cannot be separated from the other two—says:

"'If there be one conclusion more clear than another, deducible from all the history of mankind, it is the danger of hasty and inconsiderate legislation upon weights and measures. From this conviction, the result of all inquiry is, that, while all the existing systems of metrology are very imperfect and susceptible of improvements, involving in no small degree the virtue and happiness of future ages; while the impression of this truth is profoundly and almost universally felt by the wise and powerful of the most enlightened nations of the globe; while the spirit of improvement is operating with an ardor, perseverance, and zeal, honorable to the human character, it is yet certain that, for the successful termination of all these labors, and the final accomplishment of the glorious object, permanent and universal uniformity, legislation is not alone competent. All trifling and partial attempts at change in our existing system, it is hoped, will be steadily discountenanced by Congress.'

"In this conclusion, which applies with even greater force to coinages, a fact fully recognized by Mr. Adams himself, the committee may safely now unite.

"For the reasons herein set forth it is respectfully recommended that the bill be not now passed into a law."

MR. DUNNING'S SUGGESTIONS.[1]

Mr. George F. Dunning, superintendent of the United States assay office in New York, in a letter to Mr. Dubois, of the Philadelphia mint,

[1] Appended to the report of Senator Morgan.

February 8, 1868, expresses his views as given below. In forwarding this letter to Senator Morgan, Mr. Dubois expresses his hearty concurrence:

"1. The present weight of the gold 5-franc piece is not justified by any scientific reasons better than the mathematical accident that 620 weigh exactly a kilogram, a circumstance which has not the slightest importance. The fact is, this fractional and inconvenient weight, which the world is now invited to adopt, was not fixed upon by the French themselves by design, but as the unavoidable result of a false theory. The famous coinage law of the 7th Germinal An. XI attempted to make a double standard, and to fix the ratio of gold to silver as 1 to 15½. Then having very sensibly adjusted the weights of their silver coins in integral numbers, 5 grains for the franc, and 25 grains for the 5-franc piece, they were compelled to accept for the 5-franc gold piece the interminable decimal resulting from the division of 25 grains by 15.5, viz: 1.61290322580645.

"2. The awkwardness and inconvenience of this weight can best be shown by giving the weight of a few of the gold coins of France, Great Britain, and the United States, as they will be if the proposed unit is adopted:

Denominations of coins.	Existing weight of gold, 900 fine.	Proposed weight adopting 1612.9 milligrams for monetary units.	Equivalents in troy weight.
FRENCH COINS.	*Milligrams.*	*Milligrams.*	*Grains.*
Five francs	1,612.903	*1,612.903	24.8908
Twenty-five francs	8,064.516	*8,964.516	124.4544
One hundred francs	32,258.064	*32,258.064	497.8177
BRITISH COINS.			
Four shilling piece	1,627.196	†1,612.903	24.8908
Sovereign	8,135.983	†8,064.516	124.4544
Five sovereigns	40,679.915	†40,322.580	622.2721
UNITED STATES COINS.			
Dollar	1,671.813	‡1,612.903	24.8908
Half eagle	8,359.064	‡8,064.516	124.4544
Eagle	16,718.129	‡16,129.032	248.9088
Double eagle	33,436.258	‡32,258.065	497.8177
	Grams.	*Grams.*	*Grains.*
One thousand francs—French	322.5806	322.5806	4,978.1769
One thousand dollars—United States	1,671.8129	1,612.9032	24,890.8840
One thousand pounds sterling	8,135.9840	8,064.5161	124,454.4220

* No change. † Reduction 0.88 per cent. ‡ Reduction 3.52 per cent.

"3. The following table shows the weight of the same denominations of coin, &c., by adopting 1620 milligrams instead of 1612.9 for the monetary unit:

Denominations of coins.	Existing weights of gold, 900 fine.	Proposed weight, adopting 1620 milligrams for the monetary unit.	Equivalent in troy weight.
FRENCH COINS.	*Milligrams.*	*Milligrams.*	*Grains.*
Five francs	1,612.903	*1,620	25
Twenty-five francs	8,064.516	*8,100	125
One hundred francs	32,258.064	*32,400	500
BRITISH COINS.			
Four shilling piece	1,627.196	†1,620	25
Sovereign	8,135.983	†8,100	125
Five sovereigns	40,679.915	†40,500	625
UNITED STATES COINS.			
Dollar	1,671.813	‡1,620	25
Half eagle	8,359.064	‡8,100	125
Eagle	16,718.129	‡16,200	250
Double eagle	33,436.259	‡32,400	500
	Grams.	*Grams.*	
One thousand francs	322.580	324	5,000
One thousand dollars	1,671.813	1,620	25,000
One thousand pounds sterling	8,135.984	8,100	125,000

* Increase 0.44 per cent. † Reduction 0.44 per cent. ‡ Reduction 3.1 per cent.

"4. It will be noticed that the proposed unit of 1620 milligrams[1] has the merit of offering to Great Britain an even compromise of the difference between her present coinage and that of France, instead of a reduction of the British gold coins of $\frac{88}{100}$ per centum to make them equal to the French coins. The unit of 1620 milligrams exactly splits the difference, requiring an increase of the French coins of $\frac{44}{100}$ per centum, and a diminution of $\frac{44}{100}$ per centum in the British coins. This difference is so slight as hardly to call for any legal adjustments of existing contracts in either country; and while in the United States such an adjustment will doubtless be required, the proposed unit of 1620 makes the reduction of our coins almost one-half per centum less than would be effected by the unit of 1612.9. The exact difference as shown by the above tables is $\frac{42}{100}$ of one per centum.

"5. There is another very important advantage offered by the unit of 1620 milligrams, which you and all who have to do with mint calculations

[1] The exact equivalent of 1620 milligrams is in troy grains 25.0004; discarding this fraction of $\frac{4}{10000}$ involves a discrepancy in calculations of only one cent in $600, or $\frac{1}{600}$ of one per cent.

will appreciate. I allude to the facility of making calculations. I will not attempt to exhibit the difficulties in calculating value from the standard weight when the relation is expressed in such interminable decimals as must result from the adoption of the unit 1612.9. But you will see at a glance the facility of dealing with the unit of 1620.

"The weight of 1,000 francs, or $200, or £40, at 1620 milligrams to the dollar, would be 324,000 milligrams. These values are readily deduced from the weight, as will be seen by the following examples:

France.	United States.	Great Britain.
Milligrams 324,000	Milligrams 324,000	Milligrams 324,000
÷9=36,000	÷ 9=36,000	÷90=3,600
÷9= 4,000	÷ 9= 4,000	÷90= £40
÷4= 1,000 francs.	÷20= $200	

"The above divisions are performed mentally without difficulty, and the rule of calculation is exceedingly simple. It is not at the mint alone, nor chiefly, that this facility of calculation will be appreciated. The transactions in coin and bullion the world over will be simplified by it. The experts at the mint can soon adapt themselves to any system, however complicated; but for the convenience of commerce the relation of weight to value in the coins of the world ought to be simple.

"6. If the troy system of weights is to be continued in this country and Great Britain, it will be immensely important that the monetary unit expressed in milligrams should be easily convertible into troy weight. A glance at the tables given above will show the discrepancy between the unit of 1612.9 and the troy system, and also the beautiful and almost marvellous harmony effected by the unit of 1620 milligrams.

"7. I trust, however, that Mr. Sherman's bill will contain a section making the use of the French system of weights obligatory in all the mints of the United States. This change would seem to be almost a necessary part of the plan of monetary unification of the world's coinage; and it would certainly be a judicious method of partially familiarizing the country with the metrical system, the universal adoption of which, even if not perfect, is so devoutly to be wished."

BILL INTRODUCED BY MR. KELLEY.

In the House of Representatives, July 21, 1868, Hon. William D. Kelley, of Pennsylvania, introduced a bill designed to promote the establishment of an international metrical system of coinage. It was read twice and referred to the Committee on Coinage, Weights, and Measures.[1] It proposes unification upon the decimal-metrical basis, and, as the whole bill is short and concise, it is here given entire:

"Whereas certain nations of Europe have adopted and have proposed to the rest of the world a coinage which was originally based upon that system of weights known as the metrical, but which, under the influence

[1] 40th Congress, 2d session, H. R. 1445.

of circumstances, has departed from its intended character; and whereas there is an assured expectation that this character of simple relationship to metrical weights will be ultimately returned to; and whereas the coinage of the United States can be brought into exact conformity with metrical weights by a change in its value, amounting to less than one-third of one per centum in the case of gold coins: Therefore,

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That the gold hereafter coined by the United States shall contain, for each dollar of denominational value, one and one-half grams of pure gold, and shall weigh, for each dollar, one and two-thirds grams, the proportion of alloy being thus kept as one to ten.

"SEC. 2. *And be it further enacted*, That such coins shall be legal tenders in payments arising from contracts made at any time after the first of January, eighteen hundred and sixty-nine, and that in case of all other payments, including those from the United States to its creditors, one thousand and three dollars of this new coinage shall be the legal equivalent of one thousand dollars of the old coinage of the United States, such being their actual relative values.

"SEC. 3. *And be it further enacted*, That such coins shall have stamped upon them, in addition to other devices, their weight in grams and the inscription, nine-tenths fine.

"SEC. 4. *And be it further enacted*, That the silver half dollars, and all smaller silver pieces, hereafter to be coined, shall consist of standard silver, nine-tenths fine, and shall be of the weight of twenty-five grams for each dollar of denominational value; and shall have their weight and fineness legibly stamped upon them; and shall be legal tenders for the payment of all sums not exceeding ten dollars."

The provisions of the foregoing bill are in accordance with the

VIEWS OF MR. E. B. ELLIOTT.

At the meeting of the American Association for the Advancement of Science at Chicago, in 1867 and 1868, Mr. E. B. Elliott, of Washington, D. C., read a paper upon "The Metrical Unification of International Coinage," in which was advocated, if any immediate change should be deemed necessary, the adoption of gold coins, which should have very simple relations with the *gram*, the metric unit of weight. The proposed French coinage did not have this simple relation, whereas the present weight of our own gold coins is almost strictly metrical, the variation being only about three mills in the dollar.

He also called attention to the important fact that the principal gold coins of the United States, Russia, Spain, and certain states of Central America, were so nearly metrical (giving the exact numerical relations in each case) that a change in the laws making them strictly so would prove only a nominal change, no recoinage being necessary. He also called attention to the fact, of still higher interest, that in 1857

all Germany and Austria adopted a strictly metrical coinage of gold, by establishing the Union crown and half-crown—the former containing precisely ten grams and the latter five grams of fine gold. These several countries, which may be called countries of metrical coinage, have a population of about 200,000,000, a number greatly exceeding the population of the countries following the gold coinage of France, with its complex and cumbrous relations to the metric unit of weight, the gram. He alluded also to the fact that several of the most prominent scientific men of France and Belgium—among others the eminent M. Chevalier—were earnestly opposed to retaining the existing coinage of those countries, simply on the ground of its want of harmony with their beautiful system of weights and measures.

These views of Mr. Elliott are exemplified by the following tabular exhibit of the relations of the existing and proposed systems of coinage:

Examples of existing and proposed systems compared.

Existing United States system closely approximates to the metrical system.	Metrical system, should be adopted.	System which it is thought should not be adopted.
9-10 of pure metal to 1-10 of alloy.	9-10 of pure metal to 1-10 of alloy.	9-10 of pure metal to 1-10 of alloy.
Standard gold.—Legal tender in payment of all amounts. ($3) 5.015 grams.	($3) 5 grams	($3) 30-31 of 5 grams, or 4.8387 grams. (The gold legal tender 15-franc piece of France.)
Ratio of value of gold to silver. 14⅓ (nearly) to 1.	15 to 1	14½ (nearly) to 1.
Standard silver.—Fractional legal tender only in payment of small amounts.[1] ($1) 24½ (nearly) grams.	($1) 25 grasm (the legal tender silver 5-franc piece of France.)	($1) 23 2-10 (nearly) grams.

The fineness of both the gold and the silver coins in each of the above-mentioned systems is *the same*, namely $\frac{9}{10}$ of pure metal to $\frac{1}{10}$ of alloy. The ratio of gold to silver assumed in each of the above cases is a safe one, being below the market rate, and consequently rendering the silver coins of greater *nominal* value (expressed in gold values) than their actual market values. This is as it should be. The relative market value of gold to silver for the past 14 years has averaged $15\frac{3}{4}$ to one.

The second case—that of the metrical system—is obviously the most simple as regards the relation of the weight of the coins to the metrical unit of weight, the *gram*, as also in relation to the relative market values of gold and silver. The third case is the least simple of the three cases.

[1] Five dollars being the limit in the first case, and ten dollars in the second and third.

The simplicity of the German standard compared with others is still more clearly shown by the succeeding table:

Comparison of German and other standards.

Coins.	Present content of pure gold in grams.	Proposed content of pure gold in grams.		
		German, or metric.	French.	British.[1]
Three Union crowns of Germany (gold)	30. 0000	30	29. 032258+	29. 28954+
Twenty United States dollars (gold)	30. 0926+	30	29. 032258+	29. 28954+
One hundred French francs (gold)	29. 032258+	30	29. 032258+	29. 28954+
One thousand British pence (gold)	30. 5100—	30	29. 032258+	29. 28954+
Four British pounds or sovereigns (gold)	29. 28954+	30	29. 032258+	29. 28954+
Four Spanish doubloons each of 10 escudos (gold)	30. 1932	30	29. 032258+	29. 28954+
Five Russian half-imperials, each of 5 gold roubles, or 5.15 silver roubles	29. 9035	30	29. 032258+	29. 28954+

CONCLUSION.

In conclusion, the various systems and modifications discussed in the foregoing pages may be succinctly compared.

Upon the necessity and advantages of establishing a uniform system of money of account and coins, and upon the adoption of a single standard of gold $\frac{9}{10}$ths fine, there appears to be a general unanimity of opinion. The question to be decided then is: what system in the abstract is the best? or which of the proposed systems shall be adopted?

There is no doubt that by disregarding the existing systems and looking at the subject theoretically, a complete and universal decimal-metrical system could be devised that would be far more complete and satisfactory than any yet proposed; but as it would be practically impossible for the nations to unite upon such a theoretically perfect system, at least for a couple of generations, the best way is to arrive at unification by approximations, modifying the existing systems as little as possible, consistent with harmony, and thus avoiding great changes in value of moneys of account and in coin.

There are now three prominent systems of unification proposed:

1st. That of the Paris conference, embodied in the bill introduced by Senator Sherman.

2d. The system introduced in the Senate by Senator Morgan.

3d. The system embodied in the bill introduced in the House of Representatives by Hon. W. D. Kelley.

The system of the Paris conference requires the United States gold dollar to be diminished in weight from 1.671813 gram to 1.612903 gram, or 3.52 per cent., this being equivalent to $3 52 in value on every $100. Neither the gross weight of the coin nor the weight of the fine gold in the coin have either simple or convenient relations to the gram, and

[1] Basis of the sovereign.

an interminable complex fraction is required to express the weight decimally.

The second system, or that suggested by Mr. Dunning and Senator Morgan, requires the dollar to be reduced in weight to 1.620 gram, or 3.10 per cent., being $3 10 in value on every $100. The fraction in this case is not interminable, and the weight is much more simply expressed than in the first system; and, moreover, it has simple relations with the troy weights, and can be easily converted from terms of one system into those of the other.

A third system requires the dollar to be reduced in weight to just one and two-thirds (1.666666+) gram, or $\frac{3}{10}$ of 1 per cent., being equivalent to thirty cents ($0 30) in value on every $100. This may be called a metrical system; for, according to it $3 in gold would weigh exactly 5 grams, and $6 would weigh 10 grams, and $10 16$\frac{2}{3}$ grams. The proposed modifications of existing weights, and the percentage of change, not only of the dollar, but of the franc and of the pound, are shown and compared in the annexed table.

Comparison of existing and proposed weights.

System proposed.	Proposed weight of pure gold contained, according to different systems.	Existing weight of gold 9-10 fine.	Proposed weight according to the different systems.	Difference of weight.	Per cent. of difference.
1.—PARIS CONFERENCE. (Sherman bill.)	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per cent.*
Five-franc piece	1.451713+	1.612903	1.612903+	0.000000	0.00
Dollar of United States	1.451713+	1.671813	1.612903+	—0.058910	—3.52
One-fifth of a £	1.451713+	1.627196	1.612903+	—0.004293	—0.88
2.—DUNNING SYSTEM.					
Five-franc piece	1.458	1.612903	1.620	+0.007097	+0.44
Dollar of United States	1.458	1.671813	1.620	—0.051813	—3.10
One-fifth of a £	1.458	1.627196	1.620	—0.007196	—0.44
3.—METRIC SYSTEM. (Kelley bill.)					
Five-franc piece	1.5	1.612903	*1.666666+	+0.043763	+2.08
Dollar	1.5	1.671813	1.666666+	—0.005147	—0.30
One-fifth of a £	1.5	1.627196	1.666666+	+0.039470	+2.43
Fifty pence	1.5	1.691997	1.666666+	—0.028330	—1.67

*1.666666+ =1⅔=10-6.

APPENDIX A.

ADDITIONAL INFORMATION UPON THE PRODUCTION OF THE PRECIOUS METALS IN SEVERAL COUNTRIES.

Since the foregoing pages were printed, later statistics from Australia, Mexico, and California, have been received, and it is thus possible to present the following extracts supplemental to the statistical information already given:

AUSTRALIA.

NUMBER OF MINERS IN THE GOLD FIELDS.

The following table shows the total number of miners employed in the gold fields of Victoria from 1859 to 1867 inclusive:[1]

Year.	Alluvial miners.		Quartz miners.		Total miners.
	Europeans.	Chinese.	Europeans.	Chinese.	
1859	85,249	25,149	15,342	24	125,764
1860	69,724	20,542	18,268	28	108,562
1861	61,516	24,536	14,403	8	100,463
1862	53,042	23,634	16,675	28	93,379
1863	54,050	23,271	15,661	12	92,994
1864	47,234	21,589	16,155	8	84,986
1865	41,226	20,905	17,298	28	79,457
1866	35,816	20,100	14,844	34	70,794
1867	33,407	15,629	13,970	47	63,053

"In 1866 there was a decrease in the number of quartz miners as compared with 1865 of 2,448, and it is a hopeful sign that this year it is so much smaller, and that in the two districts, Ballarat and Beechworth, where the decrease was so remarkable in 1866, there is this year, in both, a small increase.

"That the total number of miners in 1867 should be little more than half of the number for 1859 is, at the first view, somewhat perplexing, and seemingly irreconcilable with that appearance of prosperity which is observable in nearly every part of the colony; yet, when taken in connection with other statistics, those relating to roads, public works, municipalities, agriculture, and stock, it is even more surprising that so much should have been done for the permanent improvement of the

[1] This table and the following extracts are from the "Mineral Statistics of Victoria for the year 1868."

towns, in the construction of railways and roads, and in reclaiming waste lands, and that still more than 60,000 persons among a population of 660,000 should continue to give all their labor to the work of searching for gold."

On the 31st of December, 1867, there were 15,629 Chinese miners engaged in alluvial mining, and 47 in quartz mining, making a total of 15,675.

AVERAGE EARNINGS OF MINERS.

The following is a statement of the average earnings per man per annum for the past eight years, without distinction of classes.

	£	s.	d.
1860	79	9	3
1861	74	15	11
1862	67	17	10
1863	70	9	2
1864	74	1	9
1865	74	4	2
1866	80	8	3
1867	87	1	7

The mean for the eight years is £76 1*s.* nearly.

The average earnings per annum of the alluvial miners and quartz miners severally, (using the mean numbers employed throughout the year,) from 1863 to 1867 are as follows:

Average earnings of alluvial and quartz miners.

Year.	Alluvial miners.		Quartz miners.	
	Numbers.	Earnings per man per annum.	Numbers.	Earnings per man per annum.
		£ s. d.		£ s. d.
1863	76,343	59 7 10¼	16,024	123 3 9¼
1864	67,982	61 6 0	15,414	130 13 9¾
1865	65,484	66 16 3	17,730	101 10 5½
1866	57,892	66 4 1	15,685	132 17 4¾
1867	51,719	67 10 7¼	14,138	158 11 8¾

"These calculations must not be accepted as absolutely correct, though every endeavor has been made to get accurate data, both as regards the number of miners employed severally in alluvial mining and quartz mining and the total quantities of gold derived respectively from the alluviums and the veins.

"Looking at the estimates made by the mining surveyors and mining registrars of the total yields of gold from both sources, as given by them from year to year, it seems almost beyond doubt that a larger quantity of gold is raised in the colony than is recorded in the returns. What becomes of it or how it is removed is inexplicable.

"The estimates of the officers are based on information given (confidentially) by the bank managers and the gold buyers in their several divisions; and making every allowance for discrepancies and errors, it still seems probable that the total quantity of gold, as recorded every year, is below the quantity actually raised.

"With respect to the earnings of the quartz miners the difficulty is not great because there is some check, though an insufficient one, on the estimated quantity of gold got. This cannot fall below, nor very greatly exceed the amount given in table No. 20, [viz., 948,850$\frac{1}{20}$ tons yielded 498,677 ounces 12 pennyweights, an average of 10 pennyweights, 12.2 grains per ton,] which shows the quantities of gold actually obtained from certain parcels of quartz crushed. The average earnings of the quartz miner would amount to £141 1*s.* 9$\frac{1}{4}$*d.*, if we assumed that no more was produced than is set down in that table; but it is well known that it is at present impossible to get returns from all the mills.

"It is satisfactory to note that, in whatever way this matter is tested, this fact is indisputable, that both from the alluvial mines and the quartz veins the average returns per man per annum are higher this year than they have been at any time during the past eight years."

MACHINERY FOR WORKING ALLUVIAL AND QUARTZ MINES.

"The tables relating to machinery do not give a fair indication of the improvements which have been made in the appliances for the extraction of gold from quartz veins. The total number of engines employed remains nearly as it was last year; but many small additions to apparatus, which it is not possible to comprise in a return, have been made in several of the larger establishments with good results."

The number of steam engines and stamp-heads for reducing vein-stuff for the past four years are as follows:

Mining machinery.

Year.	ALLUVIAL MINING.		QUARTZ MINING.		
	Steam engines employed in winding, pumping, puddling, &c.		Steam engines employed in winding, crushing, &c.		
	Number.	Aggregate horse-power.	Number.	Aggregate horse-power.	No. of stamp-heads.
1864	441	6,891	447	7,746	4,575
1865	473	8,2[illegible]8	491	8,606	5,119
1866	480	9,981	510	9,231	5,437
1867	470	9,863	532	9,955	5,529

According to the returns made by the mining registrars and surveyors there are 2,381 auriferous quartz reefs already opened, and 868$\frac{1}{4}$ square miles of auriferous ground which have been worked more or less.

YIELD OF QUARTZ PER TON.

The following table shows the average yield per ton for each district for the past eight years:

District.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
	Dwts. grs.	*Dwts. grs.*	*Dwts. grs.*	*Dwts. grs.*	*Dwts. grs.*	*Dwts. grs.*	*Dwts. grs.*	*Dwts. grs.*
Ballarat	12 13	8 0	5 15	4 22	4 16.4	5 3.9	4 21	6 21.7
Beechworth	74 9	33 23	21 12	49 7	23 16.4	27 10.3	18 3.7	12 19.2
Sandhurst	47 1	30 9	14 2	26 16	9 16.9	13 11.8	9 16.8	9 2.2
Maryborough	27 21	22 13	18 7	13 9	12 5.8	10 22.1	11 7.3	10 6.2
Castlemaine	22 11	16 19	15 7	14 3	13 23.7	13 4.9	13 18.5	11 12.4
Ararat	31 15	19 13	14 6	10 5	11 4.4	13 16.7	15 11.9	17 17.1
Gipp's Land	.....	.....	.....	.....	.....	.....	.....	27 5.6

"The large yields of 1860 and 1861 are explained when the tables to which the averages relate are contrasted with those for the following years. At first it was not possible to get returns from many of the mills, and those obtained had reference to parcels which gave exceptional results.

"The average yield during the past year has varied from 3 pennyweights 6.9 grains, in the southern division of the Ballarat district, to 4 ounces 8 pennyweights 13.5 grains, in the Jamieson south subdivision of the Beechworth district."

Since the first publication of the official mining statistics of Victoria, information has been received concerning an aggregate of 4,925,440$\frac{11}{20}$ tons of quartz, which have been crushed and the average yield of their total was 11 pennyweights 16.14 grains per ton. The average for 1867 of 948,850$\frac{12}{20}$ tons, in various districts was 10 pennyweights 12.2 grains.

The average yield of gold from certain parcels of quartz tailings cement "mulloch," &c., crushed in 1867, in the several mining districts, range from 2 pennyweights 16.3 grains, to 5 pennyweights 12 grains, and averaged 3 pennyweights 19 grains.

COST OF CRUSHING QUARTZ AND CEMENT.

The prices charged for crushing quartz and cement in the several districts during the last quarter of 1867, ranged from 4 shillings to £1 10*s*. The price of gold per ounce for the same period ranged from £3, to £4 1*s*. 6*d*. The quantity of gold obtained during the year (1867) was, approximately:

	Ounces.
From quartz veins	560,527
From alluvial washings	873,160$\frac{6}{20}$
Total gold extracted	1,433,687$\frac{6}{20}$

There were, December, 1867, 2,300 miles aggregate length of water races, the approximate cost of which was £321,903.

EXTRACTION OF GOLD FROM AURIFEROUS PYRITES.

An interesting question, now engaging a large share of public attention, is the extraction of gold from auriferous pyrites.

The following statements, which bear upon it, are taken from the reports of the mining surveyors and registrars:

"In the Creswick division 165 tons of pyrites yielded 751 ounces 8 pennyweights of gold, or an average of 4 ounces 11 pennyweights 189 grains per ton.

"In the Crooked River subdivision two tons gave 94 ounces 14 pennyweights, or at the rate of 48 ounces 7 pennyweights per ton.

"There is a machine at Twist's creek which has been erected for the purpose of operating on auriferous pyrites, but no returns have yet been received.

"From the Blackwood division a number of samples have been sent to Melbourne, and the yield is said to be from £17 to £32 per ton.

"In the Buckland division one miner collects pyrites from the old tail-races. He has not kept a record of the yields, but he estimates that, on an average, 1 ton of the tailings yields 1 ounce of gold.

"In the Sandhurst division the manager of the Comet company obtained gold at the rate of 3 or 4 ounces per ton from a few tons of *blanketings* put through an arrastra. Several companies are saving their tailings; and, as many of the reefs in this division contain large quantities of auriferous pyrites, a fair field is open to the practical chemist and experienced miner."

Mr. H. A. Thompson, who has directed much attention to the extraction of gold from pyrites, communicated the result of his system, as it is in operation at Clunes, in a letter to the *Bendigo Advertiser*.

They are thus stated:

Quantity of concentrated pyrites operated on	268 tons.
Amount of gold obtained	796 ozs. 8 dwts.
Value of gold	£3,169 7*s*. 9*d*.
Cost of operating	£800 4*s*.
Profit on one year's work	£2,369 3*s*. 9*d*.
Proportion of total gold contents extracted	86 per cent.
Leaving loss	14 per cent.

The average return of gold is therefore about 3 ounces per ton, and the cost of extracting the gold £3 per ton, or £1 per ounce.

The prices per ton for crushing quartz, &c., have ranged from 4*s*. to £1 10*s*.

The lowest prices obtain in the districts of Ballarat and Castlemaine, and the highest in Beechworth and Gipp's Land.

Additional particulars—touching the weight and cost of stamp-heads and shanks or lifters, the quantities of quartz crushed per head per diem, the number of holes per square inch in the gratings, the quantity of water used, and the quantity of quicksilver used and the quantity lost—are

for the first time, included in these statistics. They have reference only to the principal gold mines in the several districts; but they will not on that account be less useful.

WEIGHT AND COST OF STAMPS.

"In the Ballarat mining district the stamp-heads and shanks or lifters vary in weight from 4 hundred weight to 8 hundred weight 2 quarters, and the cost is from £3 17*s*. 6*d*. to £15 10*s*. The height the stamp-head falls ranges from 7 to 10 inches. The number of strokes made by stamp-heads per minute is from 50 to 85. The quantity of quartz crushed per head per diem of 24 hours varies from 1 ton to 4 tons. The number of holes per square inch in the gratings used is from 40 to 200.—(The latter number is made use of by the Victoria company at Clunes; the grating is fixed at the back of the stamper-box.) The horse-power required to work each stamper is from 1 to 2. The quantity of water used per stamp-head in crushing varies from 950 gallons to 8,640 gallons per diem of 24 hours. The quantity of mercury used in the ripples per stamper is from 5 to 75 pounds. The quantity of mercury lost per stamp-head per week varies from 1 ounce to 8 ounces.

"In the Beechworth mining district the stamp-heads and shanks or lifters vary in weight from 4 hundred weight, 1 quarter, 17 pounds to 7 hundred weight, 3 quarters, and the cost from £5 3*s*. 6*d*. to £13 per head. The height the stamp-heads fall varies from 5 inches to 14 inches. The number of strokes made by the stamp-heads per minute is from 40 to 90. The quantity crushed per head per diem of 14 hours ranges from 16 hundred weight to 4 tons. The number of holes per square inch in the gratings used is from 60 to 140. The horse-power required to work each stamp-head is from 0.75 to 1.50. The quantity of water used per stamp-head in crushing varies from 720 gallons to 11,520 gallons per diem of 24 hours. The quantity of mercury used in the ripples per stamper is from 5 to 70 pounds. The quantity of mercury lost per stamp-head per week varies from ½ ounce to 8 ounces.

"In the Sandhurst mining district the stamp-heads and shanks or lifters vary in weight from 5 hundred weight to 8 hundred weight, and the cost from £4 5*s*. to £8 11*s*. The height the stamp-heads fall varies from 6 to 18 inches. The number of strokes made by stamp-heads per minute is from 25 to 75. The quantity of quartz crushed per head per diem of 24 hours ranges from 18 hundred weight to 3 tons 3 quarters. The number of holes per square inch in the gratings used is from 64 to 140. The horse-power required to work each stamp-head is from 0.66 to 2. The quantity of water used per stamp-head in crushing varies from 4,000 gallons to 8,640 gallons per diem of 24 hours. The quantity of mercury used in the ripples per stamper is from 10 to 40 pounds. The quantity of mercury lost per stamp-head per week varies from ½ ounce to 5½ ounces.

"In the Maryborough mining district the stamp-heads and shanks or lifters vary in weight from 4 hundred weight 2 quarters to 8 hundred

weight, and the cost from £4 18*s*. 6*d*. to £8 14*s*. 6*d*. The height the stamp-heads fall varies from 6 to 22 inches. The number of strokes made by stamp-heads per minute is from 50 to 75. The quantity of quartz crushed per head per diem of 24 hours ranges from 1 ton to 3 tons. The number of holes per square inch in the gratings used is from 70 to 144. The horse-power required to work each stamp-head is from 0.50 to 2.50. The quantity of water used per stamp-head in crushing varies from 900 to 8,640 gallons per diem of 24 hours. The quantity of mercury used in the ripples per stamper is from 3 to 30 pounds. The quantity of mercury lost per stamp-head per week varies from 1¾ ounces to 8 ounces.

"In the Castlemaine mining district the stamp-heads and shanks or lifters vary in weight from 4 hundred weight 2 quarters to 8 hundred weight, and the cost from £4 2*s*. 6*d*. to £21 11*s*. 6*d*. The height the stamp-heads fall varies from 6 to 15 inches. The number of strokes made by stamp-heads per minute is from 35 to 75. The quantity of quartz crushed per head per diem of 24 hours ranges from 1 ton to 3 tons 5 hundred weight. The number of holes per square inch in the gratings used is from 40 to 144. The horse-power required to work each stamp-head is from 0.50 to 2. The quantity of water used per stamp-head in crushing varies from 4,800 to 12,960 gallons per diem of 24 hours. The quantity of mercury used in the ripples per stamper is from 6 to 40 pounds. The quantity of mercury lost per stamp-head per week varies from ¼ ounce to 24 ounces.

"In the Ararat mining district the stamp-heads and shanks or lifters vary in weight from 5 hundred to 6 hundred weight 3 quarters, and the cost from from £7 to £8 8*s*. The height the stamp-heads fall varies from 7½ to 10 inches. The number of strokes made by stamp-heads per minute is from 60 to 72. The quantity of quartz crushed per head per diem of 24 hours ranges from 1 ton 5 hundred weight to 1 ton 10 hundred weight. The number of holes per square inch in the gratings used is from 90 to 120. The horse-power required to work each stamp-head is 0.75. The quantity of water used per stamp-head in crushing varies from 4,320 to 12,960 gallons per diem of 24 hours. The quantity of mercury used in the ripples per stamper is from 6 to 47 pounds. The quantity of mercury lost per stamp-head per week varies from ½ ounce to 7 ounces.

"In the Gipp's Land mining district the stamp-heads and shanks or lifters vary in weight from 6 hundred weight to 7 hundred weight 2 quarters, and the cost from £5 5*s*. to £40. The height the stamp-heads fall varies from 7 to 10 inches. The number of strokes made by stamp-heads per minute is from 60 to 80. The quantity of quartz crushed per head per diem of 24 hours ranges from 1 ton 10 hundred weight to 2 tons 1 hundred weight. The number of holes per square inch in the gratings used is from 70 to 250. The horse-power required to work each stamp-head is from 0.75 to 1.50. The quantity of water used per stamp-head in crushing varies from 1,600 gallons to 25,000 gallons[1] per diem of 24 hours.

[1] This is excessive.

The quantity of mercury used in the ripples per stamper is from 10 to 37 pounds. The quantity of mercury lost per stamp-head per week varies from ½ ounce to 32 ounces."

MEXICO.

PRESENT CONDITION OF MINING FOR SILVER AND GOLD.

By the kindness of E. L. Plumb, esq., acting minister of the United States to Mexico, I am able to add some late and valuable information to that already given in Chapter V upon the production of silver and gold in Mexico.

It appears from the recent report of the minister of industry that the production of the precious metals is greater than is indicated by the data and estimates obtained from other sources, upon which the statements given on page 156 of this report from the Statesman's Year Book are based. Instead of $12,500,000 to $13,000,000, the production is considered as not less than $20,000,000 for silver and gold. This estimate is based upon the returns of the coinage at the various mints, full returns from which are given, showing that in the 10 years from 1858 to 1867, inclusive, (including also the returns for one year, 1857, for one mint, Durango,) the aggregate coinage has been $173,496,910. To this may be added an estimated amount for the state of Sonora of $10,000,000 more, thus making an average of over $18,000,000 a year. An abstract of these mint returns is here given. The statement of coinage given on page 157 is for one mint only, that of Guanajuato.

Gold and silver coinage at the mints of Mexico, from 1858 *to* 1867, *inclusive, ten years, including coinage at Durango for* 1857.

Name of mint.	Silver.	Gold.	Total.
Culiacan, from 1858–1867, 10 years	$7,214,540 37	$1,559,856 00	$8,774,396 37
Chihuahua, from 1858–1867, 10 years	5,483,000 00	382,768 00	5,865,768 00
Durango, from 1857–1867, 11 years	6,785,170 25	368,565 00	7,153,735 25
Guadalajara, from 1858–1867, 10 years	3,650,364 36	96,252 00	3,746,616 36
Guanajuato, from 1858–1867, 10 years	.....	.....	49,114,840 00
San Luis Potosi, from 1858–1867, 10 years	.....	.....	14,170,656 50
Mexico, from 1858–1867, 10 years	38,380,564 50	1,787,646 00	40,168,210 50
Oaxaca, from 1858–1867, 10 years	1,189,921 75	335,313 60	1,525,231 35
Zacatecas, from 1858–1867, 10 years	42,276,448 07	701,008 00	42,977,456 00
Total amount of gold and silver	.....	.....	173,496,910 43

The silver and gold coinage at the nine mints for 1867 amounted to $18,278,866.

The ratio per cent. of the silver to the gold coinage as far as shown above is as 95.26 to 4.74.

The following are the totals of coinage of the Mexican mints for each year since the war of independence up to 1858, thus, with the foregoing table, completing the exhibit of the coinage up to 1868, with the exception of one year, (1857.)

Coinage of the Mexican mints.

1822	$9,816,525	1840	$13,162,567
1823	9,785,024	1841	13,475,632
1824	9,560,472	1842	13,800,266
1825	8,927,658	1843	12,075,698
1826	8,177,471	1844	13,671,230
1827	10,395,291	1845	15,236,717
1828	10,237,448	1846	15,414,453
1829	12,164,483	1847	17,636,115
1830	11,608,871	1848	19,203,688
1831	10,258,299	1849	19,386,570
1832	12,216,460	1850	19,389,336
1833	12,642,876	1851	17,481,934
1834	12,972,148	1852	18,190,514
1835	11,815,687	1853	17,028,921
1836	11,530,622	1854	17,249,946
1837	11,470,509	1855	17,593,475
1838	13,084,267	1856	19,205,656
1839	12,525,085		

This shows a total from the independence of Mexico in 1822 to 1857 of $478,392,014, and, if we allow $18,000,000 for 1857, a total to 1868 of $680,000,000, in round numbers.

The amount of coin in circulation was estimated in 1805 at over $78,000,000, and Lempriere, in 1862, estimated it at $70,000,000.

In taking the amount of coinage as an indication of the total production of Mexico, it is to be considered that a part of this coinage may consist of a recoinage of old and worn coin, and of bullion which may have passed through the mints before. But these sources of error are more than counterbalanced by the amount of silver secretly exported, or smuggled out of the country along both coasts, and on the frontier, which is acknowledged to be very large. Lempriere, with the official documents and information before him, states that the total value of gold and silver legally exported since the conquest down to 1858, a period of 339 years, is estimated at $4,640,204,889. This gives $13,687,920 as the average legal exports of the precious metals per annum from the landing of Cortez to 1858.[1]

REDUCTION WORKS OF PACHUCA.

The following tabular statement shows the quantity of ores worked, the costs, and yield, at several of the mills in the district. There are other establishments for working ores at San Antonio, La Purissima, De Enmedio, De Jesus, Guadalupe, and San Antonia Regla.

[1] Lempriere's Mexico, p. 215. From information supplied by the Ministerio de Fomento and . . L. Plumb, esq.

Tabular statement of ores worked and of the results obtained in 1862.

	Names of the works.	Proprietors.	Number of cargas reduced in three months.	Cost per monton of 30 quintals.	Method employed.	Yield per monton.		Percentage of loss.	Loss of quicksilver per mark of silver produced.	Consumption of material per monton.		
						By assay.	By working.			Arrobas of salt.	Sulphate of copper.	Cargas of timber.
						Ms.	*Ms.*	*Ms.*	*Onz.*			
Pachuca	Loreto	Comp. Inglesa	11,430	$37 56	Patio	12.72	12.66	7.73	12.66	6.84	0.95	0.36
Do	La Purisima	Sr. Jecker	1,463	37 56	....do	19.14	12.66	7.73	12.35			
Do	La Luzchica	Tello y Comp		37 56	....do	Parada	Parada	7.73	12.35	6.84	0.95	0.36
Real del Monte	Guerrero	Comp. Inglesa										
Omitlan	El Aviadero	.....do										
Do	Sanchez	.....do	10,300	30 96	Barrels	13.95	12.89	7.60	4.82	7.35	0.95	7.77
Do	Velasco	.....do	22,800	27 71	... do	12.24	10.42	14.87	5.45	8.33	0.95	7.61
Velasco	Peñafiel	.....do									0.95	7 61
Huasca	San Miguel	.....do	11,910	28 59	Barrels	12.83	9.71	24.32	2.42	6.11	0.95	9.95
Do	Regla	.....do	13,150	26 73	Patio y fun	13.90	12.45	10.43	13.29	6.84	0.79	9.95
El Chico	San Cayetano	Neg. de Arévalo	2,850	18 00	....do	12.00	9.00	25.00	10.55	7.50	3.00	9.95
Do	San Diego	Sr. Mancera	1,900	18 00	Patio	12.00						
Do	San Pascual	Sr. Rule	300	18 00	....do							
Do	San Francisco	Sr. Villamil	720	18 00	....do							
Do	Orizavita	Sres. Villamil	210	18 00	....do							

[1] Extract from Memoria de los Trabajos Ejecutados por la Commission Cientifica de Pachuca, Mexico, 1865.

ENCOURAGEMENT OF MINING IN MEXICO.

The comparatively depressed condition of mining in Mexico is exciting much attention there at the present time, and it is proposed to abolish some of the taxes upon mining, and to permit the free exportation of ores of silver and other metals. An elaborate report has been made upon this subject by a commission appointed for the purpose by the Junta de Mineria. As this report contains much valuable general information upon the industry of mining in Mexico, and its relations to all other industries, copious extracts have been translated and are here presented.

REPORT OF THE COMMITTEE ON MINING TAXES.[1]

[Translation, abridged.]

It is a fixed fact, demonstrated by the past and attested by the present, that mining constitutes the chief resource of Mexico. But this truth is even now denied by some, who contend that agriculture is the real source of the wealth of Mexico; by others who say that manufacturing is the basis of our prosperity; and even by a few who assert that Mexico ought to be sustained by commerce. It has been declared by some that the protection to mining interests has prevented the development of other industries. Our miners have been blamed for digging gold and silver, to the neglect of other mineral wealth, such as coal, which is worth more to some countries than our mines of precious metals are to us.

The chief business of our country is mining for gold and silver. This is not because it has been encouraged by the different administrations of the country, but because it is almost the only profitable business. Though we have fertile lands, indigenous fruits, varied climates, and extensive sea-coasts, the configuration of the land is such that these advantages cannot be readily utilized.

The central table-land of our country is separated from either sea-coast by rugged mountains and deep ravines, breaking it into longitudinal zones of different temperatures and varied productions; but this fact almost cuts off communication between these zones and the sea-coast east and west.

While such natural difficulties exist, increased by territorial extent, manufactures and agriculture cannot thrive; because the cost of transport is so great, we cannot contend with foreign competition, and our vegetable products must be confined to home consumption.

But such is not the case with the precious metals, particularly silver, for no country can rival Mexico in the yield of that metal; and then, gold and silver are so valuable, compared to bulk and weight, that transportation is not expensive. Such are the advantages of the mining of

[1] Dictamen de la comision de impuestos nombrada por la junta de mineria que el ministerio de hacienda convoco en su circular de 18 de Marzo de 1868.

the precious metals, and this explains why they have always formed four-fifths of the revenues, not reckoning the contraband export, which has always been considerable.

Mexico has vast mines of iron, zinc, lead, tin and copper. There is enough iron in Mexico to supply the whole world for many years, if we had the material for smelting it, and the means of transportation. For this reason, many States have to use imported iron. The other common metals are little used in the country, and only small quantities of them are exported from mines near the coast and on the frontier.

Gold and silver mining requires but little fuel, and less machinery. The mining of these metals can be carried on wherever a mule can go with quicksilver, and wherever the sun shines warm enough to facilitate the work; whereas iron mines require much machinery and vast labor, and can only be made profitable where water or steam can be conveniently used; and everybody knows that wood and water are the chief wants of our otherwise favored land.

Stone coal has been discovered in many parts of the republic, and must eventually take the place of wood as a fuel in our country. The strength of nations is now estimated by the quantity of fuel they can command; that being so, our coal mines must soon become more valuable to us than our silver mines. But to profit by this new mineral wealth, we need cheap labor and easy transport.

Iron and coal are necessary to manufactures, and they cannot increase so long as we have to import machinery. To import machinery to advantage is almost impossible, as the land transport is double and often quadruple the original cost of the machinery.

From what we have said, it is evident that agriculture and manufactures must be limited to home consumption; and for these reasons mining must have the advantage over all other industries.

Now let us consider the conditions of this internal consumption. If production and consumption are only exchanges of excesses between different kinds of industry, the one most favored by circumstances should be most encouraged, for the benefit it gives indirectly to others; and in our country this is mining, as we will endeavor to demonstrate in the course of this report.

But even this internal exchange of the products of the country is very limited on account of bad roads; and on this account agriculture and manufactures are principally confined to a limited circuit near flourishing mines, and depend entirely upon the success of the mining interests. An occasional drought or an early frost, injuring the particular crop of a certain mining region, will bring in agricultural products from adjoining districts, but this does not often happen.

Now, as the different mining districts cannot be readily connected by good roads, we must increase the number of the districts, and encourage mining in every way, principally by awarding prizes for discoveries of mines or new modes of working them. The mining board should pre-

sent a petition to this effect to the general government, and also ask for the opening of good roads. If Congress had applied half the war appropriations for this purpose, it would have converted an unproductive fund into a source of public wealth.

In course of time good roads would have an immense influence upon our different industries, and free agriculture from its strict dependence upon mining. If our agricultural produce could be conveniently exported, the fertile regions of Mexico, now as sterile as African deserts, would smile in their abundance. With passable roads, our iron, coal and lead would become valuable, and give life to all arts and trades exercised among us. But before such a lovely perspective can be realized, gold and silver mining must continue to be the principal, if not the exclusive industry of our country, and our rise or fall will depend upon it. Let us now glance at the state of mining industry in our country from the earliest times.

In 1803 Humboldt said, "There are about 500 mining districts in the kingdom of New Spain, and the number of mines worked in them amounts to 3,000." He then goes on to enumerate the mines and give their situation; and though our territory has been greatly diminished, all those mines mentioned by the distinguished traveller yet belong to us. Whether that be true or not, it is certain that our mines have neither diminished in number nor in yield of the precious metals.

The same author classified the mining districts thus, beginning at the richest: Zacatecas, Catorce, Guanajuato, Guarisamey, Durango, Rosario, Tasco, Zacualpam, Temascaltepec, Bolaños, Jalisco, Sonora, Real del Monte, Pachuca, Zimapan, Cosiguiriachi, Parral, Batopilas, Oaxaca, and Villalta.

Since Humboldt's time the same mines have continued to be worked, and the central groups have always yielded most. Pachuca has prospered exceedingly. We find from these data that many of our old mines have not been worked since that time; and as population has decreased on the borders of our country, few new discoveries have been made. Soon after Upper California ceased to belong to us we were grieved to hear of the gold and cinnabar discovered there that we had not found.

The mineral wealth of the States of Durango, Sonora, and Chihuahua is greater than all the rest of our territory, judging from certain indications; and it will be developed as soon as settlers are protected from the scalping knives of the savages. To effect this Congress has recently passed a law establishing military colonies in those regions; and if the design be properly accomplished it may prove a protection to adventurous miners, and thus greatly augment the wealth of the country.

Even in those mines that have long been worked, the maximum richness of the veins has not been reached, owing to the difficulty, danger, and expense of working under ground. In this difficult labor many years often pass and much money spent before the mines begin to pay. The

persons who open mines are rarely paid for their toil. It is said that mines opened in the 16th and 17th centuries, and worked at intervals since, did not begin to yield a profit till the 18th or 19th century. The hardness of the material to be excavated, or its extreme softness, or too much water, make the labor so expensive that a generation passes before a paying part of a vein is reached.

If we consider the want of skill in working many mines, or the want of proper economy, causing so many to fail in first enterprises, we are not surprised that so few attempts are made to open new mines. Though a miner be ruined in fortune, his money has kept many alive, does general good, and benefits a future generation. For these reasons the calling of a miner has been considered as noble and meritorious by those governments that prefer general good to individual profit, and look to the future as well as to the present. A love for mining was once looked upon as a kind of madness, and men who were afflicted by it lost credit. Any farmer or merchant who wished to take an interest in a mining enterprise had to do it secretly, for fear of ruining his business.

Rich as the ores of old mines were, they could not last, because the expenses of working the mines became too great. Now we think it the duty of a provident and careful government to encourage the opening and working of new mines in every way; they should be liberal and generous to beginners, and put no impediments in their way; they should be exempt from all tax on what they consume; and the government should do all in its power to make a new mine pay expenses from the beginning, though the ores be poor.

It is also a difficult task to re-open mines that have once been worked; water often fills the shafts, masses of rubbish stop the drifts, timber supports have rotted and fallen in the tunnels, landslides have encumbered the way, and often bad air stops respiration. It was for such reasons that mining laws have always opposed the abandonment of a mine, and required plans and specifications of all mines to be filed in the public archives, and granted so many privileges to those who re-open abandoned mines. An abandoned mine requires almost as much labor as a new one; neglected work of no other kind suffers so much.

With little encouragement to mining, it is no wonder that only old and well-known mines have been worked up to the present day. If the government wishes all kinds of industry to prosper it must encourage mining.

Mr. Elhuyar, in his memorial on the influence of mining upon agriculture, manufactures, population, and civilization in New Spain, written during the first revolution, in colonial times, was so satisfied of the importance of mining to the country that he proposed to fill the empty national treasury and furnish everything free to the miners if the colonial government would give him the administration of mines.

Persons not familiar with mining think the ores of mines very rich; they suppose a bar of silver of 136 marks comes out of a few quintals of

ore. If this were the case the miner would have all the profits, and none would go to the state, or benefit other industries. Few have a just idea of the vast amount of ore and labor used to produce the 2,500,000 marks of silver yielded annually by our mines. The famous Valenciana mine of Guanajuato, in the best times, only yielded five ounces of silver to one quintal of ore; at Pachuca and Real del Monte it gave only three ounces per quintal; the best ores of Zacatecas gave less than three ounces; Fresnillo, one ounce. Such was the average yield. One hundred millions of ore had to be dug out of the earth to yield that sum. This fact will give some idea of the number of hands, the quantity of tools and animals required in mining. The Valenciana mine employs 3,100 laborers, not counting thousands employed in connection therewith. At Fresnillo 3,400 were employed at one time, and many of them supported large families.

About the middle of the 17th century the yield of silver was 500,000 marks; in 1630, 601,065 marks were coined; and in 1700, the coinage was only 397,543 marks. The duties on silver at that time amounted to 26 per cent.; they have since been lessened, though not sufficiently, in our opinion.

In 1720 the coinage was $12,000,000. The value of quicksilver was then $62 a quintal, and its consumption amounted to 42,618 quintals. In 1776 the price of quicksilver came down to $41, and the yield of silver was increased thereby. The college of mines was organized that same year, and mining was relieved from many taxes. In 1802 the coinage was $27,000,000, the largest ever reached. In 1712 the revenue from mines was $3,068,410; in 1764, it was $6,000,000; and in 1792, $19,000,000.

Nearly all our old mines are vast heaps of earth and ore thrown out, as too poor to be worked. Now, if this rubbish were washed, levigated, and amalgamated, much silver would be obtained by little labor. As much as 14 ounces per 20 quintals have been obtained from this refuse; and this yield would give a profit if no taxes were paid on it.

Silver is very unequally distributed in lodes; a vein is often broken by poor ore that will hardly pay, and miners must work on unpaid till they reach a lode that will enrich many families. To encourage this constant labor, all taxes upon mining must be removed. If this is done, many new mines would be opened and old ones would be worked with a prospect of a future profit.

The increase in the produce of the precious metals would be nothing compared to the impulse that mining would give to agriculture, manufactures, and commerce. The public revenue would be amply compensated for the supposed loss sustained by abolishing mining taxes. Trinidad Garcia, deputy from Zacatecas, gives the following data of the Fresnillo mines when worked by Proaño: from 1860 to 1863, $481,221 taxes were paid on the profits of those mines, amounting to over $120,000 a year. From 1866 to 1867, only $37,119 were paid in taxes on the same mines. Thus the government has suffered an annual loss of $83,185 for

not encouraging Mr. Proaño's enterprise. From 1853 to 1862, the yield of those mines was near $10,000,000, making more than $1,000,000 per year, and more than one-fourth of the national coinage. Fresnillo then had a population of 17,000; it now has scarcely 5,000.

So convinced of these facts was Mr. Auza, governor of Zacatecas, that he advised congress to relieve Mr. Proaño of all taxes upon his enterprise, and give him as a loan for five years all the profits of the mine above $37,000, the amount of taxes collected on the mine during the last fiscal year.

As we have shown that mining lends such influence to all other pursuits, it is evident that its encouragement would tend to promote universal industry and peace. What sources of prosperity for our unfortunate country!

As it is seen, we do not consider mining as advantageous to Mexico from the nature and quality of its products, which are the precious metals; nor do we commit the vulgar error of giving to these metals a value more tangible than that of other kinds of salable effects; but we see in mining an exhaustless source of industry, and in the precious metals an article of trade that has the advantage over all other articles, from its facility of transportation over bad roads and its small bulk compared to its value. One thousand ounces of gold are worth in this capital about 8,000 arrobas of sugar, and they can be carried to Vera Cruz for three or four dollars, while the sugar would cost from twelve to twenty thousand dollars, over the same roads. The ratio of freight, then, is 1 to 4,000. We have taken for comparison one of the most important of our agricultural products, but it does not belong to the region of the central tablelands, the most densely populated part of our country. What can be sent out of those regions except gold and silver? Cotton went up to such a price during the civil war in the United States that it could be profitably exported; but now it needs a protective tariff to enable it to compete with foreign cotton. If the precious metals then have no limit to their production, why are so many obstacles placed in the way of their production and exportation? What we have said relates to mining in connection with other national industries and internal commerce; but it is evident that foreign commerce or importation is also much influenced by it.

In his work on the foreign commerce of Mexico, Mr. Lerdo de Tejada has shown that more than four-fifths of the duties on exports were levied on the precious metals; the other duties were upon produce of the coast region, such as cochineal, vanilla, tobacco, dyewoods, and other articles of less importance. As the export duty on the precious metals is very high, much gold and silver is smuggled out of the country without paying export duty. The time is now come when we should shake off the old prejudices against foreign commerce, and encourage it rather than oppose it. To do this, and foster all other arts in this country, we ought to let the precious metals go out free without any tax.

We will not pretend to combat the common prejudice against the free export of gold and silver in bars or in coin, for political economy has already demonstrated that those metals do not differ in any respect from the other products of the soil. If there is a surplus of metal it must go out in exchange for necessaries for home consumption; but we will insist that if the precious metals are the only products of the country that have no limit, and that mining stimulates agriculture, manufacture and commerce, no obstacle should be placed in the way of its production, for by so doing all other branches of industry suffer as well as the public treasury.

We will now proceed to show that silver has to pay 24 per cent. of its net value on exportation, and all of this falls upon the miner. If the miner were allowed the free use of the metals which he produces, and were not compelled to coin them, nor prohibited from exporting them, he could sell his mark of pure silver at $9 41½, its intrinsic value.

Now let us see what really becomes of 1,000 marks produced by him by the present system of taxes. We will suppose this silver to be pure, of the maximum fineness—that is, 12 dineros. The miner takes this sum to the assay office, where he has to pay a total of 6¼ per cent., making $562 50 before he gets it back. Then he takes it to the mint, where the coinage will cost him $415 36 more. But this is not all; neither the weight nor the fineness of the coins which the miner receives corresponds with the sum he is said to receive; for a diminution is not only permitted but advised by the ordinances of 1728, chapter 9. The diminution allowed is three-thousandths; that is, if the alloy should be 902.778 parts of pure silver, and 97.222 of copper, corresponding to 10 dineros 20 granos, the actual alloy is 899.78 of silver and 100.22 of copper; and this loss, too, falls upon the miner.

To simplify the calculation, we have supposed the silver to be pure—that is, of 12 dineros; but there is another loss in assaying which we have not mentioned. Improvements in docimacy have shown that the precious metals suffer two kinds of losses in cupelation: one is from the absorbtion of the metal by the crucible, and the other is its vaporization by heat, or, more properly speaking, the vapor of the oxide of lead which comes from the crucible carries off a portion of the melted metal with it mechanically. So that is another cause of loss to the miner.

And here is another source of loss: existing laws requires only halves of thousands to be marked in assaying. Thus, if the assay calls for 997¼, or ⅓, it is marked at 997, because it is less than one-half. This loss, added to that by fire just mentioned, was so considerable that it attracted the attention of Mr. Elhuyar at the beginning of this century. At that time the only mint of Mexico was in the capital.

The loss to the miner is still greater when silver is mixed with gold and has to be separated, but we will not treat of this at present, as we must confine ourselves to silver.

We think we have now demonstrated that the miner alone bears the

cost of coining, and it is the duty of the committee on mints to propose a remedy for this injustice to our most worthy producers.

We will now go back to our miner with his 1,000 marks of coined silver, which we will suppose he wishes to take to a port. His whole sum amounts to $9,415 36, and he has already paid on it $1,024 45, leaving $8,391 01. On this he has yet to pay a circulation tax of 2½ per cent., making $209 78. So he reaches the port with $8,181 23. On this again he has to pay an export duty of 7½ per cent., making $613 59. That leaves him with $7,567 64 for exportation. State taxes reduce this to $7,551 91. After all these reductions the miner finds he has lost 24.66 per cent. of the original amount, and his mark is reduced to $7 55, causing him to lose $1 86 on each mark, originally $9 41.

I will here anticipate an objection to this calculation, which is that the miner is not always the exporter of his silver. No matter; he will still have to lose the 24.66 per cent. in getting rid of it. If, for instance, he bought 20 yards of linen with his mark in bar, if he had it coined he could only buy 15 yards; for the merchant, without knowing it, would make that discount.

These exorbitant taxes make it worse for the miner than it was at the beginning of the 18th century, when the whole duty was only 26 per cent.

Some persons fear that if a free export of the precious metals were allowed, not enough would be left in the country for its commerce. Now money is like any other merchandise; its supply will depend upon the demand in the public markets. Exchange is the price of freight on money, and it will go where it is wanted. Trying to prevent the export of the precious metals, as the government has sometimes done, always causes harm to the community.

A compensation for the free export of gold and silver would be compensated in many ways. Free export of silver would increase the imports at least to the value of the metal sent out, and the duties on the goods imported would amount to more than the taxes on the silver exported.

Our custom-house returns of last year show that the revenue from imports amounted to 70 per cent., while the export tax on the precious metals only amounted to 26.66 per cent., as I have stated. Thus the national treasury would gain by the reverse system of the present.

This expected increase of export of the precious metals is not fancy, but is founded on the fact that there are large quantities of poor surface ores that would pay for reducing, and thus give time and means for more important enterprises. Much labor might be required in this work, but it would give employment to more persons and would increase the consumption of agricultural products.

Now, if the board has paid due attention to our report, it will be assured, as we are, that the wealth, prosperity, and peace of our country hang on this administrative maxim: Give every protection to miners.

With these remarks we submit to the board the following proposal:

Let the committee on mining propose to the minister of finance, as the only way to elevate rapidly that industry to the degree of prosperity of which it is susceptible, the absolute exemption of gold and silver from all duties whatever.

Signed by Miguel Velazquez de Leon, Antonio del Castillo, Ignacio Rule. Mexico, May 25, 1868.

MR. CASTILLO ON THE ABOLITION OF THE EXPORT DUTIES ON THE PRECIOUS METAS.

A writer in the "Opinion Nacional" having argued that by relieving mining from the old taxes, by which 25 per cent. in value of the products were paid to the government, the public treasury would suffer a loss of $1,250,000 annually, Mr. Castillo replies by a letter, from which the following extracts are taken.[1]

Mr. Castillo is sure that the treasury will not suffer by the removal of this great tax; on the contrary, its removal will benefit the public treasury by acting as a stimulus to all kinds of industry. He says:

"It is evident that the export of the ores of gold and silver will tend to promote their production, which will encourage other industries beneficial to every country. The wealth of our mines does not depend upon the richness, but upon the abundance of the ore, as we see in the Rosario mine at Pachuca, where the ore only pays 12 ounces of silver to three quintals, (15 marks to 30 quintals, as the average,) or $1 per arroba.

"This being so, could the Real del Monte send its ores to Vera Cruz, and thence to Europe, with a profit, when the cost of land transportation is $1 per arroba, which is more than the ore is worth? It is absurd to think of it. This reasoning is equally applicable to mines far in the interior.

"Neither is there danger of diminution in the yield of mines near the sea coast, for it certainly would not pay to have the ore smelted abroad.

"The lessees of the mints must have originated this opposition to the free export of ores and metals in bars, for fear of losing the profits allowed them by the government for coining, as well as the other advantages not generally known.

"This act of Congress allowing the free export of the precious metals in every form has increased the non-productive mineral wealth of our country. There are certain ores of gold and silver on our Pacific coast that have resisted our simple method of reduction and amalgamation, and they will ever remain useless to us, unless we encourage the introduction of the more perfect methods of reduction used in Europe, or allow these ores a free exit. Their usual yield is one mark of silver to three quintals of ore; and as they contain a small quantity of gold, and often of lead and antimony, they might pay for exporting. The working of such mines would occupy an immense number of hands now unemployed. These miners would consume the land produce, and use the goods brought in

[1] El Siglio, XIX: Mexico, November 21, 1868.

by commerce; new roads would be opened, and new modes of transportation by rivers would be effected; all to the great advantage of the country.

"The prosperity of Mexico depends upon the prosperity of the mines, which encourage agriculture and stimulate foreign and domestic commerce.

"The only question to solve, for the encouragement of mining, is embraced in the principle of political economy: *Liberty to mining industry.*"

CALIFORNIA.

TREASURE EXPORTS.

According to the commercial statistics of the first three-quarters of the year 1868,[1] the total exports of gold bars, silver bars, and gold coin, for the first nine months of 1868 were as follows:

Gold bars	$14,762,912
Silver bars	8,243,718
Gold coin	1,572,268
Total	24,582,634

The total includes $3,735 of foreign gold coin, $1,500 Mexican dollars, $5,000 of silver, and $6,135 of dust. The amount and destination of the exports, compared with the like period in 1867, are as follows:

To—	1867.	1868.
China	$7,153,465 07	$3,978,009 65
Chili	723,450 97	.....
Central American ports	531,044 55	533,200 00
England	4,426,431 31	4,639,459 90
France	1,453,659 76	941,553 47
Japan	53,969 18	352,459 46
Mexico	26,000 00	8,000 00
New York	17,311,315 77	18,460,421 30
Sandwich islands	8,300 00	50,000 00
Society islands	500 00	.....
Vancouver island	50,000 00	95,000 00
Total	31,738,136 61	29,058,103 78
Add duties	5,993,704 00	6,560,729 95
	37,731,840 61	35,618,833 73
Decrease 1868	.....	2,113,006 88

[1] Published in the Alta California newspaper, San Francisco, October 14, 1868. This paper, the Commercial Review, and other journals on the Pacific coast, devote great attention and care to the collection and publication, at regular intervals, of valuable commercial and mining statistics, without which very little would be known of the production and movement of the precious metals in the United States.

RECEIPTS OF TREASURE.

The receipts of treasure from the interior of California, including the bullion from the State of Nevada, were as follows, the receipts for the period of nine months in 1867 and 1868 being compared:

Mines.	1867.			1868.		
	Uncoined.	Coined.	Total.	Uncoined.	Coined.	Total.
Northern	$29,528,876	$2,444,998	$31,973,874	$27,362,923	$3,199,111	$30,562,034
Southern	2,328,834	959,519	3,288,353	2,220,639	1,236,080	3,456,719
Total	31,857,710	3,404,517	35,262,227	29,583,562	4,435,191	34,018,753
Decrease 1868						1,243,474

RECAPITULATION.

Sources.	1867.	1868.
Imports	$1,665,306	$1,636,636
Coastwise receipts	4,479,556	2,414,416
Interior	35,262,227	34,018,753
Total	41,407,089	38,069,805
Decrease 1868		3,337,284

The receipts from coastwise ports and Victoria (V. I.) for the period in the two years, 1867 and 1868, were:

Condition.	1867.	1868.
Uncoined	$4,150,340	$1,735,654
Coined	329,216	678,762
Total	4,479,556	2,414,416
Decrease 1868		2,065,140

The imports of treasure (exclusive of those from Victoria, which are included in the receipts from coastwise ports) for the nine months ending September 30, 1867 and 1868, respectively, were as follows:

Country.	1867.	1868.
Japan		$4,164 00
Mexico	$1,565,113 53	1,627,271 50
Panama	67,244 25	800 00
Sandwich islands	30,447 91	4,400 00
Society islands	2,500 00	
Total	1,665,305 69	1,636,635 50
Decrease 1868		28,670 19

PRODUCTION OF GOLD UP TO APRIL, 1851.

According to an estimate given in the San Francisco Herald, and quoted in the London Times, May 19, 1851, the production of gold in the

State from the 1st of April, 1849, to the 31st of December, 1850, was $68,587,591. The custom-house records for this period, it will be remembered, were burned, and these figures thus have a peculiar value.

From the 1st of January to the 31st March, 1851, the first quarter, it is stated that the shipments were:

Date.	In hands of passengers.	Consigned.
In January	$1,042,000	$2,929,888
In February	706,890	2,278,925
In March	702,800	3,028,631
	2,451,600	8,237,542
Adding amount in hands of passengers		2,451,600
		10,689,142
It is estimated that for the same period gold was sent overland to the amount of.	$1,000,000	
Shipped by merchants	450,000	
In miners', merchants', and brokers' hands	1,000,000	
In jewelery and stamped bullion	1,517,000	
		3,967,000
Total		$14,656,142

The value in the above estimates was computed at $16 per ounce troy, but the mint value was $1 60 more. By adding this, the estimated amount for the first quarter of 1851 is carried to over $16,000,000.

NEVADA.

During the summer of 1868, remarkably rich deposits of silver ore have been found in the White Pine district, about 120 miles easterly from Austin. Large masses, consisting chiefly of chloride of silver, have been taken out, and it is expected that the region will soon produce large amounts of silver.

BORNEO.

The exports of gold from the port of Sarawak, Borneo, for five years ending in 1867, were as follows, according to the British consular returns for 1868:

1863	$5,220
1864	9,480
1865	5,394
1866	2,250
1867	6,998

APPENDIX B.

RELATIVE VALUES OF GOLD AND SILVER.

From statements by Pliny it appears that in the Roman coins the value of gold to silver was as 5,760 to 336, or as $17\frac{1}{7}$ to 1; but this was not the relative value in bullion, which appears to have been as $14\frac{13}{28}$ to 1. This ratio did not long continue. About 189 B. C. the Romans coincided with the Greeks in estimating the value of gold compared with silver as 10 to 1.

Upon Cæser's return to Rome with the spoils of war, gold became so abundant that its value, compared with silver, fell to the ratio of 750 to 100, or $7\frac{1}{2}$ to 1. This, however, was a transient depression in the value of gold, for, in the time of Claudius, about a century later, the value of gold had advanced so that its ratio to silver became as $12\frac{1}{2}$ to 1. This ratio appears to have been preserved through the reigns of Nero and Galba, and during the interval between Galba and Alexander Severus, or more than 150 years.

Under Constantine the Great the value of gold had receded, as compared with silver, to the ratio of $10\frac{1}{2}$ to 1; but 60 years after Constantine the value had increased to $14\frac{2}{5}$ to 1.

In a statement by Herodotus of the revenues of Darius, the son of Hystaspes, he proceeds upon the supposition that the value of gold to silver was as 13 to 1. It is supposed that the value of gold did not long continue to be so high in Greece, for Plato, 50 years after Herodotus, asserted the ratio to be as 12 to 1. Gold had at that time a lower value in Persia than in Greece. The ratio in Persia appears to have been as $11\frac{3}{8}$ to 1.

Gold afterwards became so plentiful in Greece that its value was estimated, compared with silver, as 10 to 1. This was about 341 years B. C. It is supposed that the value of gold, compared with silver, continued to be as 10 to 1 for 170 years after the death of Alexander.

When guineas were first coined in 1663 the value of fine gold, compared with that of fine silver, was rated in the English mint at $14\frac{321}{462}$ to 1. Guineas were then coined as 20 shilling pieces, but were afterwards made current as 21 shilling pieces. In 1805 the relative value of fine gold to fine silver was as $15\frac{2859}{13640}$ to 1, and in mints of several other countries it was rated still higher.[1]

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[1] *Vide* "A Treatise on the Coins of the Realm," in a letter to the King. By Charles, Earl of Liverpool: Oxford, 1805. 4to.

The following tabular statements show the ratio or value of gold to silver at different periods down to the present time:

RELATIVE VALUES OF GOLD AND SILVER AT DIFFERENT PERIODS.

Period.	Gold.	Silver.
Henry III.—41st year	$9\frac{51}{191}$	to 1
Edward III.—18th year, commencement of gold coinage.	$12\frac{1484}{2540}\frac{4}{3}$	to 1
Edward III.—18th year, July 9	$11\frac{1175}{2540}\frac{}{3}$	to 1
Edward III.—20th year	$11\frac{1637}{72865}$	to 1
Edward III.—27th year	$11\frac{151}{955}$	to 1
Henry IV.—13th year, silver coin debased	$10\frac{190}{573}$	to 1
Edward IV.—4th year	$11\frac{151}{955}$	to 1
Henry VIII	$11\frac{59}{220}$	to 1
Elizabeth, (old standard)	$10\frac{5614}{5921}$	to 1
Elizabeth, (new standard)	$10\frac{617}{682}$	to 1
James I.—2d and 3d years, (old standard)	$12\frac{876}{5921}$	to 1
James I.—2d and 3d years, (new standard)	$12\frac{186}{1703}$	to 1
James I.—9th year	$13\frac{10739}{29063}$	to 1
James I.—9th year	$13\frac{248}{775}$	to 1
James I.—17th year	$13\frac{2059}{5921}$	to 1
James I.—17th year	$13\frac{118}{341}$	to 1

Hunt's Merchants' Magazine for August, 1863, contains the following table, which covers a portion of the period given above, and shows the relative value of gold to silver at various periods from 1344 to 1863, as indicated by the prices paid by the mint in London:

1344	12.475 to 1	1547	11.400 to 1
1349	11.141 to 1	1549	11.250 to 1
1356	11.286 to 1	1552	11.186 to 1
1401	11.350 to 1	1553	11.198 to 1
1421	10.527 to 1	1560	11.315 to 1
1464	10.331 to 1	1600	11.100 to 1
1465	11.983 to 1	1604	12.109 to 1
1470	11.446 to 1	1626	13.431 to 1
1482	11.429 to 1	1666	14.485 to 1
1509	11.400 to 1	1717	15.209 to 1
1527	11.455 to 1	1816	15.209 to 1
1543	12.000 to 1	1849	15.632 to 1
1545	10.714 to 1	1852	15.371 to 1
1546	10.000 to 1	1863	15.069 to 1

Mr. E. B. Elliott, of Washington city, has kindly furnished the following data on this interesting subject to Commissioner Browne. The annexed tabular statement has been prepared by him with great care, and differs in some respects from that of the Merchants' Magazine:

Ratios of the market value of gold to silver, in London, for the 70 years from 1760 to 1829, inclusive, and the 26 years from 1841 to 1866, inclusive—in all, 96 years.

1760 to 1789 (30 years)	14.50 to 1	Prior to the opening of the gold mines of California and Australia.
1790 to 1809 (20 years)	14.90 to 1	
1810 to 1819 (10 years)	15.50 to 1	
1820 to 1829 (10 years)	15.80 to 1	
1830 to 1840 (11 years)	.....	
1841 to 1848 (8 years)	15.83 to 1	

Discovery of gold fields in California, 1848.

1849 to 1852 (4 years)	15.60 to 1—Transition period.	
1853 to 1858 (6 years)	15.34 to 1	Since the opening of California and Australian gold fields, average 15.38 to 1.
1859 to 1862 (4 years)	15.34 to 1	
1863 to 1864 (2 years)	15.37 to 1	
1865 to 1866 (2 years)	15.46 to 1	

Simplest, and probably most convenient, mint ratio of gold to silver, 15 to 1; present United States mint ratio of gold to fractional silver, 14.88 to 1; United States mint ratio of gold to silver dollar, (circulation limited because overvalued,) 16 to 1; British mint ratio of gold to silver, 14.28 to 1; French mint ratio of gold to silver 5-franc piece, (circulation limited because undervalued,) 15.5 to 1; French mint ratio, gold to debased smaller silver coinage, 14.38 to 1.

The ratios since 1859 were deduced from the semi-monthly quotations of the price per ounce of silver bars in London, published from time to time in the journal of the Statistical Society of London. From 1841 to 1848 the values adopted were computed from data furnished by Mr. William Newmarch in a valuable paper read by him before the London Statistical Society and published in the journal of that society. From 1760 to 1829, inclusive, the values were taken from the funding system of Mr. Jonathan Elliott, which forms part of the executive documents of the second session of the 28th Congress. For the 11 years, 1830 to 1840, inclusive, there is a lapse in the information furnished; but it is deemed safe to assume the ratio for this period as 15.8, the ratio of the periods just prior and subsequent to the interval.

It will be observed that with the discovery and working of the California and Australian gold fields the relative value of gold to silver fell from an average of $15\frac{7}{8}$ for the eight years 1841–'48, just prior to this event, to an average of $15\frac{3}{8}$ for the 14 years 1853–'66, which followed the transition period of four years 1849–'52.

APPENDIX C.

RULES FOR CALCULATION OF ALLOYS AND VALUES.

RULES FOR THE PREPARATION OF ALLOYS OF A GIVEN FINENESS.

Manufacturers of silverware may obtain an alloy of silver of any desired fineness in melting fine silver with silver of an inferior quality by observing the following rule:[1]

Obtain the difference between the two higher finenesses, and divide by the difference between the two lower; the quotient indicates the number of ounces of the silver to be raised in fineness, which are required to be added to one ounce of fine silver.

Example.—Required to raise a quantity of silver of the fineness of $\frac{867}{1000}$ to $\frac{900}{1000}$ by the mixture with it of fine silver at $\frac{999}{1000}$.

Difference between the two higher finenesses $\frac{99}{1000}$. Difference between the two lower finenesses $\frac{33}{1000}$. $99 \div 33 = 3$. From this it appears that one ounce of fine silver at $\frac{999}{1000}$ will raise the fineness of three ounces of silver at $\frac{867}{1000}$, so that the compound will consist of four ounces at $\frac{900}{1000}$.

MODE OF VALUATION.

According to law, the standard gold of the United States consists in 1000 parts by weight, of 900 of pure gold and 100 of an alloy composed of copper and silver.

Three hundred and eighty-seven ounces of pure gold are worth $8,000, and 99 ounces of pure silver are worth $128. These relations furnish the following proportions, from which are readily derived the subjoined rules:

For gold.—As $1000 : \frac{8000}{387}$, or as 99,000 : 128 :: the given weight multiplied by its particular fineness in thousandths : the value of said weight.

For silver.—As $1000 : \frac{128}{99}$, or as 387 : 8 :: the given weight multiplied by its particular fineness in thousandths : the value of said weight.

RULES.

To find the value in United States money of any number of troy ounces of gold or silver, the weight and fineness being given:

For gold.—Multiply the given weight by the fineness and by 8, and divide the product by 387.

For silver.—Multiply the given weight by the fineness and by 128, and divide the product by 99,000.

[1] This and the following rules are extracted by special permission from the "Bullion Dealers' Guide," by George W. Edelman, which contains many valuable tables useful to dealers in the precious metals.

SHORT METHODS OF CALCULATION.

FOR GOLD.

1. TO CONVERT WEIGHT INTO VALUE.

Multiply the weight by double the fineness, add to the product $\frac{1}{30}$ thereof, plus $\frac{1}{129}$ of the $\frac{1}{30}$, the answer will be in cents.

Example.—What is the value of 1,258 ounces at 774 thousandths?

$1258 \times 1548 = 19473.84$

$\frac{1}{30}$ 649.128

$\frac{1}{129}$ 5.032

Answer: $20,128.00

By this rule the value of one ounce of gold, of any fineness, may be readily determined.

Example.—What is the value of 1 ounce at 658½ thousandths?

$658\frac{1}{2} \times 2 = 1317.$

$\frac{1}{30}$ 43.9

$\frac{1}{129}$ .34

Answer: $13.6124

The division by 129 being somewhat difficult, it will be found sufficiently accurate, in most cases, to divide by 130.

2. TO CONVERT VALUE INTO STANDARD WEIGHT.

Divide the value in dollars by 20, this quotient by 20, and the second quotient by 2, add the three quotients together; the answer will be in standard ounces.

Example.—What is the weight in standard ounces of $154,686 56?

20) 154686.56

20) 7734.328

2) 386.7164

193.3582

Answer: 8314.4026 ounces.

FOR SILVER.

1. TO CONVERT WEIGHT INTO DOLLAR VALUE.

Add to the weight in standard ounces $\frac{1}{11}$ thereof, plus the $\frac{8}{10}$ of the $\frac{1}{11}$; the answer will be in dollars.

Example.—What is the value of 1268.30 standard ounces?

1268.30

$\frac{1}{11}$ 115.30

$\frac{8}{10}$ of $\frac{1}{11}$ 92.24

Answer: $1475.84

2. TO CONVERT DOLLAR VALUE INTO STANDARD OUNCES:

ubtract from the value $\frac{1}{8}$ thereof, plus $\frac{1}{8}$ of this quotient; the answer be in standard ounces.

xample.—What is the weight of $1475 84?

	$1475.84
$\frac{1}{8}$	184.48
$\frac{1}{8}$	23.06
	207.54

Answer: 1268.30 standard ounces.

APPENDIX D.

TABLES OF DEPOSITS, COINAGE, EXPORTATION, AND PRODUCTION OF THE PRECIOUS METALS.

TABLE I.—DEPOSITS OF GOLD AND SILVER.

Statement of deposits of gold and silver at the mint of the United States, the branch mint, San Francisco, assay office, New York, and branch mint, Denver, during the fiscal year ending June 30, 1868.[1]

Description of bullion.	United States mint, Philadelphia.	Branch mint, San Francisco.	Assay office, New York.	Branch mint, Denver.	Total.
GOLD.					
Fine bars	$2,142,337 12	$8,693,399 01	.....	.....	$10,835,736 13
Unparted bars	.....	.....	.....	.....	.....
United States bullion	1,300,338 53	6,156,718 83	$5,409,996 55	$357,935 11	13,224,989 02
United States coin	95,458 90	.....	54,074 90	.....	149,527 10
Jewellers' bars	157,418 38	.....	269,598 30	.....	427,016 68
Foreign coin	14,789 73	73,098 15	25,127 27	.....	113,015 15
Foreign bullion	332,711 97	56,342 53	333,556 24	.....	722,610 74
Total gold	4,043,048 63	14,979,558 52	6,092,352 56	357,935 11	25,472,894 82
SILVER.					
Bars	$219,727 08	$397,341 00	.....	.....	$617,068 08
United States bullion	67,700 78	253,293 05	$262,312 96	$5,082 67	588,994 46
United States coin	7,587 81	.....	99,935 77	.....	107,523 58
Jewellers' bars	26,530 77	.....	85,807 05	.....	112,337 82
Foreign coin	17,907 79	53,671 87	142,215 87	.....	213,795 46
Foreign bullion	3,191 56	8,936 74	41,586 18	.....	53,714 48
Total silver	342,635 79	713,287 66	631,657 83	5,082 67	1,693,423 88
Total gold and silver	$4,385,684 35	$15,693,436 18	$6,724,190 39	$363,017 78	$27,166,318 70
Less re-deposits at different institutions: gold, $2,355,128 38; silver, $219,864 48					2,574,992 86
Total deposits					$24,591,325 84

[1] From the annual report of the director of the United States mint.

Statement of the coinage at the mint of the United States, the branch mint, San Francisco, assay office, New York, and branch mint, Denver, during the fiscal year ending June 30, 1868.[1]

Denomination.	United States mint, Philadelphia.		Branch mint, San Francisco.		Assay office, New York.	Branch mint, Denver.	Total.	
	Pieces.	Value.	Pieces.	Value.	Value.	Value.	Pieces.	Value.
GOLD.								
Double eagles	188,540	$3,770,800 00	696,750	$13,935,000			885,290	$17,705,800 00
Eagles	3,050	30,500 00	12,500	125,000			15,550	155,500 00
Half eagles	5,750	28,750 00	25,000	125,000			30,750	153,750 00
Three dollars	4,900	14,700 00					4,900	14,700 00
Quarter eagles	3,650	9,125 00	26,000	65,000			29,650	74,125 00
Dollars	10,550	10,550 00					10,550	10,550 00
Fine bars	151	98,843 03			$5,567,082 77			5,665,930 80
Unparted bars						$360,879 26		360,879 26
Total gold	216,591	3,963,273 03	760,250	14,250,000	5,567,082 77	360,879 26	976,690	24,141,235 06
SILVER.								
Dollars	54,800	54,800 00					54,800	54,800 00
Half dollars	411,500	205,750 00	1,482,000	741,000			1,893,500	946,750 00
Quarter dollars	29,900	7,475 00	120,000	30,000			149,900	37,475 00
Dimes	423,150	42,315 00	310,000	31,000			733,150	73,315 00
Half dimes	85,800	4,290 00	400,000	20,000			485,800	24,290 00
Three-cent pieces	4,000	120 00					4,000	120 00
Bars	83	6,729 94			449,506 54			456,236 48
Total silver	1,009,233	321,479 94	2,312,000	822,000	449,506 54		3,321,150	1,592,986 48

[1] From the Report of the Director of the United States Mint.

TABLE II—Continued.

Denomination.	United States mint, Philadelphia.		Branch mint, San Francisco.		Assay office, New York.	Branch mint, Denver.	Total.	
	Pieces.	Value.	Pieces.	Value.	Value.	Value.	Pieces.	Value.
COPPER.								
Five-cent pieces	28, 902, 000	1, 445, 100 00					28, 902, 000	1, 445, 100 00
Three-cent pieces	3, 613, 000	$108, 390 00					3, 613, 000	$108, 390 00
Two-cent pieces	3, 066, 500	61, 330 00					3, 066, 500	61, 330 00
One-cent pieces	9, 856, 500	98, 565 00					9, 856, 500	98, 565 00
Total copper	45, 438, 000	1, 713, 385					45, 438, 000	1, 713 385 00
Total coinage	46, 663, 874	$5, 998, 137 94	3, 072, 250	$15, 072, 000	$6, 016, 589 31	$360, 879 26	49, 735, 840	$27, 447, 606 54

Summary exhibit of the entire deposits of domestic gold at the mint of the United States and branches to June 30, 1868.

Mint.	Parted from silver.	Virginia.	N. Carolina.	S. Carolina.	Georgia.	Alabama.	Tennessee.	Utah Territory.	Nebraska.	Colorado Territory.	California.
Philadelphia	$113,399 08	$1,567,910 19	$4,666,026 38	$542,667 26	$2,541,409 38	$55,627 19	$36,403 88	$4,327 11	$5,876 08	$5,920,560 93	$230,961,430 12
San Francisco	3,262,716 03	.....	.....	.....	.....	.....	.....	.....	.....	60,152 00	205,857,784 00
New Orleans	.....	.....	741 00	16,217 00	41,241 00	77,943 53	2,883 12	.....	.....	3,437 20	22,265,240 89
Charlotte	.....	.....	4,520,730 79	460,523 34	.....	.....	.....	.....	.....	.....	87,321 01
Dahlonega	.....	.....	99,585 19	311,242 81	4,310,459 61	59,629 92	42,119 75	145 14	.....	35,345 84	1,136,016 69
N. Y. assay office	432,189 40	23,683 92	147,755 95	25,821 03	159,894 64	9,124 62	273 64	83,197 30	.....	7,017,720 04	144,372,812 38
Denver	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,426,056 18	.....
Total	3,808,844 51	1,591,594 11	9,434,839 31	1,356,471 44	7,053,004 63	202,325 26	81,680 39	87,669 55	5,876 08	14,463,272 19	604,680,605 09

Mint.	Montana Territory.	Arizona Territory.	New Mexico Territory.	Oregon.	Nevada.	Washington Territory.	Dakota Territory.	Vermont.	Idaho Territory.	Other sources.	Total.
Philadelphia	$4,976,001 78	$7,883 29	$74,083 47	$184,474 19	$3,383 64	$26,127 56	$2,198 88	.....	$2,889,594 98	$44,515 50	$254,624,440 88
San Francisco	1,397,190 76	151,858 29	.....	9,303,075 99	159,238 93	35,132 94	5,760 00	.....	10,625,727 29	19,672,293 90	250,530,930 13
New Orleans	.....	.....	.....	.....	.....	.....	.....	.....	.....	7,290 00	22,414,993 74
Charlotte	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,068,575 14
Dahlonega	.....	.....	.....	.....	.....	.....	.....	.....	.....	951 00	5,995,495 95
N. Y. assay office	10,684,054 58	23,618 25	48,676 51	56,479 46	47,917 36	.....	.....	$1,512 66	556,255 81	644,125 00	164,335,112 55
Denver	151,506 06	339 48	.....	8,073 05	.....	.....	.....	.....	91,391 99	.....	1,677,366 76
Total	17,208,753 18	183,699 31	122,759 98	9,552,102 69	210,539 93	61,260 49	7,958 88	1,512 66	14,162,970 07	20,369,175 40	704,646,915 15

TABLE IV.—DEPOSITS AND COINAGE OF SILVER OF DOMESTIC PRODUCTION.

Statement of the amount of silver of domestic production deposited at the mint of the United States and branches from January, 1841, to June 30, 1868.

Year.	Parted from gold.	Oregon.	Arizona Territory.	Nevada.	Lake Superior.	Idaho Territory.	Georgia.	California.	Montana Territory.	N. Mexico Territory & Sonora.	North Carolina.	Colorado Territory.	Bars.	Total.
1841 to 1851.	$768,509 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$768,509 00
1852.....	404,494 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	404,494 00
1853.....	417,297 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	417,297 00
1854.....	328,199 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	328,199 00
1855.....	333,053 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	333,053 00
1856.....	321,938 38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	321,938 38
1857.....	127,256 12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	127,256 12
1858	300,849 36	.....	.....	.....	$15,623 00	.....	.....	.....	.....	.....	.....	.....	.....	316,472 36
1859.....	219,647 34	.....	.....	.....	30,122 13	.....	.....	.....	.....	.....	$23,398 00	.....	.....	273,167 47
1860.....	138,561 70	.....	$13,357 00	$102,540 57	25,880 58	.....	.....	.....	.....	$1,200 00	12,257 00	.....	.....	293,796 85
1861.....	364,724 73	.....	12,260 00	213,420 84	13,372 72	.....	.....	.....	.....	.....	6,233 00	.....	.....	610,011 29
1862.....	245,122 47	.....	105 00	757,446 60	21,366 38	.....	.....	$824 00	.....	.....	.....	.....	.....	1,024,864 45
1863.....	188,394 94	.....	.....	856,043 27	13,111 32	.....	.....	.....	.....	.....	.....	.....	.....	1,057,549 53
1864.....	166,791 55	.....	.....	311,837 01	8,765 77	.....	.....	.....	.....	45 00	.....	.....	.....	487,439 33
1865.....	251,757 87	.....	.....	355,910 42	13,671 51	.....	.....	459 18	.....	25 84	.....	.....	.....	621,824 82
1866.....	271,888 51	$1,580 51	139 63	540,345 87	22,913 96	$38,859 49	$403 83	453 00	.....	.....	.....	$419 00	$16,278 22	893,282 02
1867.....	265,932 64	183 68	3,212 26	579,931 76	18,555 35	160,269 24	.....	310 25	$19,095 48	.....	(*)	543 78	10,709 00	1,058,743 44
1868.....	147,358 87	.....	6,711 29	290,415 51	26,595 72	37,602 56	.....	9,196 94	23,547 73	473 56	73 75	46,881 13	397,478 40	986,335 46
Total....	5,261,776 48	1,764 19	35,785 18	4,007,891 85	209,978 44	236,731 29	403 83	11,243 37	42,643 21	1,744 40	41,961 75	47,843 91	424,465 62	10,324,233 52

* Minnesota.

TABLE IV—Continued.

ient of silver coinage at mint of the United States and branches at San Francisco and New Orleans, under act of February 21, 1853.

Year.	United States mint, Philadelphia.	Branch mint, San Francisco.	Branch mint, N. Orleans, to Jan. 31, '61.	Total.
.....	$7,806,461 00	.....	$1,225,000 00	$9,031,461 00
.....	5,340,130 00	.....	3,246,000 00	8,586,130 00
.....	1,393,170 00	$164,075 00	1,918,000 00	3,475,245 00
.....	3,150,740 00	177,000 00	1,744,000 00	5,071,740 00
.....	1,333,000 00	50,000 00	.....	1,383,000 00
.....	4,970,980 00	127,750 00	2,942,000 00	8,040,730 00
.....	2,926,400 00	283,500 00	2,689,000 00	5,898,900 00
.....	519,890 00	356,500 00	1,293,000 00	2,169,390 00
.....	1,433,800 00	198,000 00	414,000 00	2,045,800 00
.....	2,168,941 50	641,700 00	.....	2,810,641 50
.....	326,817 80	815,875 00	.....	1,142,692 80
.....	177,544 10	347,500 00	.....	525,044 10
.....	278,279 66	474,635 58	.....	752,915 24
.....	399,314 50	723,292 64	.....	1,122,607 14
.....	352,871 00	780,048 54	.....	1,132,919 54
.....	314,750 00	822,000 00	.....	1,136,750 00
otal.....	32,893,089 56	5,961,876 76	15,471,000 00	54,325,966 32

TABLE V.—TOTAL COINAGE OF THE UNITED STATES MINT.

Gold, silver, and copper coinage at the mint of the United States in the several years from its establishment in 1792; *the coinage at the branch mints and the assay office, New York, from their organization to June* 30, 1868.[1]

Years.	Gold.	Silver.	Copper.	Total.
1793 to 1795	$71,485 00	$370,683 80	$11,373 00	$453,541 80
1796	102,727 50	79,077 50	10,324 40	192,129 40
1797	103,423 50	12,591 45	9,510 34	125,524 29
1798	205,610 00	330,291 00	9,797 00	545,698 00
1799	213,285 00	323,515 00	9,106 68	645,906 68
1800	317,760 00	224,296 00	29,279 40	571,335 40
	1,014,290 00	1,440,454 75	79,390 82	2,534,135 57
1801	$422,570 00	$74,758 00	$13,628 37	$510,956 37
1802	423,310 00	58,343 00	34,422 83	516,075 83
1803	258,377 50	87,118 00	25,203 03	370,698 53
1804	258,642 50	100,340 50	12,844 94	371,827 94
1805	170,367 50	149,388 50	13,483 48	333,239 48
1806	324,505 00	471,319 00	5,260 00	801,084 00
1807	437,495 00	597,448 75	9,652 21	1,044,595 96
1808	284,665 00	684,300 00	13,090 00	982,055 00
1809	169,375 00	707,376 00	8,001 53	884,752 53
1810	501,425 00	638,773 50	15,660 00	1,155,868 50
	3,250,742 50	3,569,165 25	151,246 39	6,971,154 14
1811	$497,905 00	$608,340 00	$2,495 95	$1,108,740 95
1812	290,435 00	814,029 50	10,755 00	1,115,219 50
1813	477,140 00	620,951 50	4,180 00	1,102,271 50
1814	77,270 00	561,687 50	3,578 30	642,535 80
1815	3,175 00	17,308 00	.....	20,483 00
1816	.....	28,575 75	28,209 82	56,785 57
1817	.....	607,783 50	39,484 00	647,267 50
1818	242,940 00	1,070,454 50	31,670 00	1,345,064 50
1819	258,615 00	1,140,000 00	26,710 00	1,425,325 00
1820	1,319,030 00	501,680 70	44,075 50	1,864,786 20
	3,166,510 00	5,970,810 95	191,158 57	9,328,479 52
1821	$189,325 00	$825,762 45	$3,890 00	$1,018,977 45
1822	88,980 00	805,806 50	20,723 39	915,509 89
1823	72,425 00	895,550 00	.....	967,975 00
1824	93,200 00	1,752,477 00	12,620 00	1,858,297 00
1825	156,385 00	1,564,583 00	14,926 00	1,735,894 00
1826	92,245 00	2,002,090 00	16,344 25	3,110,679 25
1827	131,565 00	2,869,200 00	23,577 32	3,024,342 32
1828	140,145 00	1,575,600 00	25,636 24	1,741,381 24
1829	295,717 50	1,994,578 00	16,580 00	2,306,875 50
1830	643,105 00	2,495,400 00	17,115 00	3,155,620 00
	1,903,092 50	16,781,046 95	151,412 20	18,835,551 65

[1] From the report of the Secretary of the Treasury, 1868, pp. 448, 449.

, silver, and copper coinage at the mint of the United States, &c.—Cont'd.

Years.	Gold.	Silver.	Copper.	Total.
.....	$714,270 00	$3,175,600 00	$33,603 60	$3,923,473 60
.....	798,435 00	2,579,000 00	23,620 00	3,401,065 00
.....	978,550 00	2,759,000 00	28,160 00	3,765,710 00
.....	3,954,270 00	3,415,002 00	19,151 00	7,388,423 00
.....	2,186,175 00	3,443,003 00	39,489 00	5,668,667 00
.....	4,135,700 00	3,606,100 00	23,100 00	7,764,900 00
.....	1,148,305 00	2,096,010 00	55,583 00	3,299,898 00
.....	1,809,595 00	2,315,250 00	63,702 00	4,188,547 00
.....	1,375,760 00	2,098,636 00	31,286 61	3,505,682 00
.....	1,690,802 00	1,712,178 00	24,627 00	3,427,607 61
	18,791,862 00	27,199,779 00	342,322 21	46,333,963 21
.....	$1,102,107 50	$1,115,875 00	$15,973 67	$2,233,957 17
.....	1,833,170 50	2,325,750 00	23,833 90	4,182,754 40
.....	8,302,797 50	3,722,260 00	24,283 20	12,049,330 70
.....	5,428,230 00	2,230,550 00	23,977 52	7,687,757 51
.....	3,756,447 50	1,873,200 00	38,948 04	5,668,595 54
.....	4,034,176 57	2,558,580 00	41,208 00	6,633,965 50
.....	20,221,385 00	2,374,450 00	61,836 69	22,657,671 60
.....	3,775,512 50	2,040,050 00	64,157 99	5,879,720 49
.....	9,007,761 50	2,114,950 00	41,984 32	11,164,695 82
.....	31,981,738 50	1,866,100 00	44,467 50	33,392,306 00
	89,443,328 00	22,226,755 00	380,670 83	112,050,753 83
.....	$62,614,492 50	$774,397 00	$99,635 43	$63,488,524 93
.....	56,846,187 50	999,410 00	50,630 94	57,896,228 44
.....	55,213,906 94	9,077,571 00	67,059 78	64,358,537 72
.....	52,094,595 47	8,619,270 00	42,638 35	60,756,503 82
.....	52,795,457 20	3,501,245 00	16,030 79	56,312,732 99
.....	59,343,365 35	5,196,670 17	27,106 78	64,567,142 30
an. 1 to June 30, inclusive)	25,183,138 68	1,601,644 46	63,510 46	26,848,293 60
cal year	52,889,800 29	8,233,287 77	234,000 00	61,357,088 06
cal year	30,409,953 70	6,833,621 47	307,000 00	37,550,585 17
cal year	23,447,283 35	3,250,636 26	342,000 00	27,039,919 61
	470,838,180 98	48,087,763 13	1,249,612 53	520,175,556 64
.....	$80,708,400 64	$2,883,706 94	$101,660 00	$83,693,767 58
.....	61,676,576 55	3,231,081 51	116,000 00	65,023,658 06
.....	22,645,729 90	1,564,297 22	478,450 00	24,688,477 12
.....	23,982,748 31	850,086 99	463,800 00	25,296,635 30
.....	30,685,699 95	950,218 69	1,183,330 00	32,819,248 64
.....	37,429,430 46	1,596,646 58	646,570 00	39,672,647 04
.....	39,838,878 82	1,562,694 18	1,879,540 00	43,281,113 00
.....	24,141,245 06	1,592,986 48	1,713,385 00	27,447,616 54
	$321,108,709 69	$14,231,718 59	$6,582,735 00	$341,923,157 28

Gold, silver, and copper coinage at the mint of the United States, &c.—Con'd.

RECAPITULATION OF COINAGE FROM 1793 TO 1868, INCLUSIVE.

Years.	Gold.	Silver.	Copper.	Total.
1793–1800, 8 years	$1,014,290 00	$1,440,454 75	$79,390 82	$2,534,135 57
1801–1810, 10 years	3,250,742 50	3,569,165 25	151,246 39	6,971,154 14
1811–1820, 10 years	3,166,510 00	5,970,810 95	191,158 57	9,328,479 52
1821–1830, 10 years	1,903,092 50	16,781,046 95	151,412 20	18,835,551 65
1831–1840, 10 years	18,791,862 00	27,199,779 00	342,322 21	46,333,963 21
1841–1850, 10 years	89,443,328 00	22,226,755 00	380,670 83	112,050,753 83
1851–1860, 9½ years	470,838,180 98	48,087,763 13	1,249,612 53	520,175,556 64
1861–1868, 8 years	321,108,709 69	14,231,718 59	6,582,735 60	341,923,163 28
Total 75 years	$909,516,715 67	$139,507,493 62	$9,128,548 55	$1,058,152,757 84

RECAPITULATION OF AVERAGES OF COINAGE FOR EACH DECADE FROM 1793 TO 1868, INCLUSIVE.

1793–1800, 8 years	$126,786 25	$180,056 84	$9,923 85	$316,766 94
1801–1810, 10 years	325,074 25	356,916 52	15,124 64	697,115 41
1811–1820, 10 years	316,651 00	597,081 09	19,115 86	932,847 95
1821–1830, 10 years	190,309 25	1,678,104 69	15,141 22	1,883,555 16
1831–1840, 10 years	1,879,186 20	2,719,977 90	34,232 22	4,633,396 32
1841–1850, 10 years	8,944,332 80	2,222,675 50	38,067 08	11,205,075 38
1851–1860, 9½ years	49,561,913 79	5,061,869 80	131,538 16	54,755,321 75
1861–1868, 8 years	40,138,587 46	1,778,964 82	822,840 62	42,740,392 90

TABLE VI.—IMPORTS AND EXPORTS OF COIN.

Statement exhibiting the imports and exports of coin and bullion from the United States from 1821 *to* 1868, *inclusive.*[1]

Years ended—	Imports.	Exports.		
		Domestic exports.	Foreign re-exports.	Total.
September 30, 1821	$8,064,890	.....	$10,478,059	$10,478,059
1822	3,369,846	.....	10,810,180	10,810,180
1823	5,097,896	.....	6,372,897	6,372,897
1824	8,379,835	.....	7,014,552	7,014,552
1825	6,150,765	.....	8,797,055	8,797,055
1826	6,880,966	$605,855	4,098,678	4,704,533
1827	8,151,130	1,043,574	6,971,386	8,014,880
1828	8,489,741	693,037	7,550,439	8,243,746
1829	7,403,612	612,886	4,311,134	4,924,020
1830	8,155,964	937,151	1,241,622	2,178,773
1831	7,365,945	2,058,474	6,956,457	9,014,931
1832	5,907,504	1,410,941	4,245,399	5,656,340
1833	7,070,368	366,842	2,244,859	2,611,701
1834	17,911,632	400,500	1,676,258	2,076,758
1835	13,131,447	729,601	5,748,174	6,477,775
1836	13,400,881	345,738	3,978,598	4,324,336
1837	10,516,414	1,283,519	4,692,730	5,976,249
1838	17,747,116	472,941	3,035,105	3,508,046
1839	5,595,176	1,908,358	6,868,385	8,776,743
1840	8,882,813	2,235,073	6,181,941	8,417,014
1841	4,988,633	2,746,486	7,287,846	10,034,332
1842	4,087,016	1,170,754	3,642,785	4,813,539
Nine months to June 30, 1843	22,390,559	107,429	1,413,362	1,520,791
June 30, 1844	5,830,429	183,405	5,270,809	5,454,214
1845	4,070,242	844,446	7,762,049	8,606,495
1846	3,777,732	423,851	3,481,417	3,905,268
1847	24,121,289	62,620	1,844,404	1,907,024
1848	6,360,284	2,700,412	13,141,204	15,841,616
1849	6,651,240	956,874	4,447,774	5,404,648
1850	4,628,792	2,046,679	5,476,315	7,522,994
1851	5,453,592	18,069,580	11,403,172	29,472,752
1852	5,505,044	37,437,837	5,236,298	42,674,135
1853	4,201,382	23,548,535	3,938,340	27,486,875
1854	6,939,342	38,062,570	3,218,934	41,218,504
1855	3,659,812	53,957,418	2,289,925	56,247,343
1856	4,207,632	44,148,279	1,597,206	45,745,485
1857	12,461,799	60,078,352	9,058,570	69,136,922
1858	19,274,496	42,407,246	10,225,901	52,633,147
1859*	7,434,789	57,502,305	6,385,106	63,887,411
1860*	8,550,135	56,946,851	9,599,388	66,546,239
1861*	46,339,611	23,799,870	5,991,210	29,791,080
1862*	16,415,052	31,044,651	5,842,305	36,886,956
1863*	9,584,105	55,993,562	8,163,049	64,156,611
1864*	13,115,612	100,321,371	4,922,979	105,244,350
1865*	9,810,072	64,618,124	3,025,102	67,643,226
1866*	10,700,092	82,643,374	3,400,697	86,044,071
1867*	22,070,475	54,976,196	5,892,176	60,868,372
1868*	13,702,928	83,746,161	10,038,127	93,784,288

* From the manuscript records.

[1] From the Report of the Secretary of the Treasury—Finance Report—1868, p. 405.

TABLE VII.—EXPORTS OF GOLD AND SILVER

Computed real value of the registered exports of gold and silver

Countries to which exported.	Total of gold and					
	1853.	1854.	1855.	1856.	1857.	1858.
Russia	£25,309	.....	£23,295	£26,342	£5,517	.....
Denmark	.....	.....	33,097	5,283	.....	.....
Prussia	.....	.....	5,020	935	.....	.....
Hanse towns	2,382,088	£2,041,410	922,797	997,783	935,886	£658,659
Holland	1,164,097	906,147	86,665	178,832	38,033	682,021
Belgium	1,780,042	791,886	323,498	1,057,165	333,152	228,169
France	5,818,563	13,666,907	10,524,090	10,468,294	11,188,329	10,920,647
Portugal, Azores, and Maderia	549,077	365,024	377,224	148,254	251,105	127,067
Spain and Canaries	.....	2,510	1,647	1,004	50,743	60,307
Gibraltar	28,730	309,127	226,495	128,576	425,314	2,654
Malta	21,392	1,507	389	1,752	29,203	.....
Turkey	48,479	640,157	110,037	118,461	.....	653,802
Egypt	5,417,055	3,754,373	6,072,411	11,220,932	17,601,428	5,220,136
British Possessions in S. Africa	3,547	.....	1,040	.....	118,097	67,022
Mauritius	100,169	15,064	9,157	155,840	55,541	132,985
East Indies	536,107	26,352	19,608	55,047	1,168	.....
British settlements, Australia	942,955	305	148	.....	72	395
British North America	6,150	15,688	1,033	4,806	52,421	6,690
Danish West Indies	.....	12,982	.....	5,000	375,963	204,417
Spanish West Indies	21,836	.....	.....	36,438	175,207	2,079
United States	961	12,869	2,230	96,227	859,110	202,567
Mexico	.....	.....	.....	.....	.....	.....
Central America	.....	.....	.....	.....	.....	.....
New Granada	.....	.....	.....	.....	14,751	5,572
Brazil	35,036	2,044	57,445	95,440	1,012,915	415,795
Other countries	25,160	22,216	30,852	49,430	43,013	37,892
Total	18,906,753	22,586,568	18,828,178	24,851,797	33,566,968	19,628,876

[1] From "Statistical Abstract for the United Kingdom," 1853–1867, p. 84.

BULLION FROM THE UNITED KINGDOM.

bullion and specie from the United Kingdom to various countries.[1]

silver bullion and specie.

1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
£122, 287	£1, 573	.....	£1,855.501	£2,707,857	£289	.....	£8, 597	£34, 503
5, 712	.....	.....	.....	164, 227	107, 734	£21, 792	100, 292	17, 400
1, 581	.....	.....	.....	.....	.....	.....	727, 281	14, 250
1, 280, 215	397, 379	£333, 968	243, 996	1, 462, 925	248, 995	565, 400	1, 591, 269	1, 281, 062
346, 623	134, 913	348, 680	425, 040	221, 356	543, 211	1, 027, 497	1, 362, 894	1, 219, 231
257, 429	211, 415	192, 375	334, 420	211, 305	265, 297	617, 982	1, 223, 965	1, 150, 030
15, 384, 371	11, 315, 346	2, 051, 041	7, 205, 663	4, 760, 984	9, 921, 524	4, 962, 865	10, 555, 361	8, 224, 648
395, 567	602, 476	337, 562	970, 267	638, 755	202, 029	82, 415	108, 519	62, 300
346, 352	756, 064	650, 246	1, 398, 078	1, 058, 826	1, 412, 724	1, 412, 408	158, 007	295, 533
109, 946	144, 906	53, 014	105, 470	52, 695	4, 594	.....	6, 096	3, 075
.....	51, 001	50, 000	389	184, 781	110, 482	30, 021	.....	145, 727
3, 054	109	494	2, 029, 121	35, 534	33	303	.....	.....
16, 616, 531	9, 426, 122	8, 076, 334	12, 629, 830	12, 289, 430	8, 368, 122	4, 388, 522	2, 995, 871	889, 334
12, 478	50, 619	143, 464	.....	165, 967	135, 417	19, 469	4, 867	70, 719
1, 392	.....	2, 033	.....	103, 218	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....
103	29, 720	.....	.....	21, 382	8, 385	41, 202	46, 483	18, 360
26, 248	9, 000	645, 944	302, 121	131, 747	200, 621	83, 394	190, 336	96, 052
143, 070	50, 170	91, 643	184, 464	53, 608	126, 708	210	40, 689	41, 639
6, 628	41	110, 489	18, 864	95, 434	57, 527	24, 772	.....	27, 434
14, 342	1, 727, 220	7, 381, 953	37, 528	54, 195	189, 731	65, 918	1, 015, 070	63, 679
.....	.....	873	14, 999	122, 472	12, 834	.....	.....	.....
.....	123	647	416, 094	10, 870	2, 409	3, 046	713	399
168, 491	12, 437	20, 823	541, 144	30, 712	25, 439	51	7, 063	20, 104
197, 062	524, 312	169, 813	452, 392	1, 731, 037	1, 069, 650	1, 376, 671	1, 033, 909	401, 761
249, 321	89, 819	150, 252	169, 910	234, 723	118, 545	368, 586	461, 329	247, 277
35, 688, 803	25, 534, 768	20, 811, 648	29, 326, 191	26, 544, 040	23, 132, 300	15, 092, 524	21, 638, 611	14, 324, 517

TABLE VIII.—IMPORTS AND EXPORTS OF PRECIOUS METALS—FRANCE.

Value of gold coin imported into and entered for home consumption in France, and the value thereof exported from France, distinguishing French produce.[1]

Years.	Total imports.	For home consumption.	Total exports.	French produce.
1850	£1, 251, 396	£1, 251, 276	£502, 128	£499, 658
1851	3, 744, 432	3, 743, 412	675, 433	673, 416
1852	1, 671, 156	1, 597, 860	1, 281, 192	1, 253, 268
1853	2, 274, 228	2, 302, 188	973, 968	971, 772
1854	4, 495, 716	4, 500, 192	2, 238, 960	2, 238, 840
1855	4, 306, 884	4, 245, 072	6, 306, 060	6, 303, 936
1856	7, 683, 168	7, 680, 252	3, 579, 948	3, 566, 388
1857	11, 129, 136	11, 128, 368	4, 782, 976	6, 382, 088
1858	12, 067, 612	12, 040. 504	2, 606, 766	2, 603, 760
1859	14, 787, 192	14, 748, 476	7, 311, 467	7, 289, 470
1860	7, 663, 136	7, 658, 400	5, 103, 299	5, 093, 685
1861	9, 089, 334	9, 069, 600	8, 418, 208	8, 377, 949
1862	12, 251, 544	11, 312, 632	9, 061, 849	7, 813, 260
1863	13, 116, 128	11, 458, 680	12, 588, 179	10, 865, 548
1864	15, 942, 588	14, 155, 908	14. 028, 865	12, 241, 710
1865	12, 927, 640	12, 926, 264	10, 210, 896	8, 530, 854
1866	25, 760, 168	25, 752, 444	12, 218, 806	11, 219, 068

TABLE IX.—IMPORTS AND EXPORTS OF PRECIOUS METALS—RUSSIA.

Value of gold coin imported into and exported from Russia.[2]

Years.	Imported.			Exported.		
	Foreign coin.	Russian coin.	Total.	Foreign coin.	Russian coin.	Total.
1860	£156, 154	£126, 873	£283, 027	£87, 442	£1, 308, 406	£1, 395, 849
1861	133, 005	146, 911	279, 916	84, 544	1, 980, 954	2, 065, 498
1862	161, 443	105, 781	267, 224	288, 047	5, 036, 504	5, 324, 551
1863	287, 172	275, 263	562, 435	479, 588	9, 128, 099	9, 607, 687
1864						
1865	115, 154	102, 939	268, 093	295, 250	2, 601, 133	2, 896, 383
1866	148, 131	72, 158	220, 289	93, 743	3, 097, 494	3, 191, 237

[1] From the Report of the Royal Commission on International Coinage, p. 342. [2] Ibid.

LE X.—A STATEMENT OF THE WEIGHT, FINENESS, AND VALUE OF FOREIGN AND DOMESTIC GOLD AND SILVER COINS.[1]

Weight, fineness, and value of foreign and domestic coins.

Country.	GOLD COINS.				
	Denomination.	Weight.	Fineness.	Value.	Value after deduction.
		Gs. dec.	*Thous.*		
ralia	Pound of 1852	0.281	916.5	$0 93.97	$0 93.71
	Sovereign of 1856-'60	0.266.5	916	4 86.68	4 89.16
ria	Ducat	0.119	986	2 98.98	2 97.04
	Sovereign	0.363	900	6 75.06	6 71.08
	New Union crown, (assumed)	0.357	900	6 64.19	6 60.87
um	Twenty-five francs	0.254	899	4 79.09	4 69.87
ia	Doubloons	0.867	870	16 99.95	16 61.40
l	Twenty milreis	0.979	917.5	19 99.07	19 85.19
al America	Two escudos	0.909	869.5	2 68.76	2 66.91
	Four reals	0.097	876	2 48.6	2 49.6
	Old doubloon	0.867	879	16 99.99	16 61.47
	Ten pesos	0.493	900	9 15.99	9 10.78
ark	Ten thaler	0.497	895	7 90.91	7 89.99
dor	Four escudos	0.433	844	7 66.46	7 61.99
nd	Pound, or sovereign, new	0.256.7	916.5	4 86.94	4 83.94
	Pound, or sovereign, average	0.256.2	916	4 84.99	4 83.59
ce	Twenty francs, new	0.207.5	899	3 86.69	3 83.87
	Twenty francs, average	0.207	899	3 84.69	3 83.77
any, north	Ten thaler	0.497	896	7 90.91	7 86.56
	Ten thaler, Prussian	0.467	903	7 97.97	7 93.59
	Krone, (crown)	0.357	900	6 64.20	6 60.89
any, south	Ducat	0.119	900	2 98.98	2 97.14
e	Twenty drachms	0.189	900	3 65.19	3 63.47
ania	Molour	0.374	916	7 68.16	7 58.04
	Twenty lire	0.207	899	3 84.96	3 83.58
	Old colony	0.969	900	6 65.99	6 61.8
	New colony	0.969	903	3 97.6	3 97.8
co	Doubloon, average	0.867.5	899	16 59.96	16 45.69
	Doubloon, par	0.867.5	900.5	16 61.16	16 59.65
	Twenty pesos, Mexican	1.667	903	19 65.09	19 56.59
e	Six francs, par	0.345	900	5 96.45	5 97.21
rlands	Ten guilders	0.603	900	9 99.96	9 97.09
Granada	Old doubloon, Regular	0.868	870	16 61.95	16 59.96
	Old doubloon, Pinto	0.801	896	15 97.75	15 97.97
	Two pesos, par	0.580	891.5	9 87.51	9 85.96
	Old doubloon	0.867	857	15 95.69	15 81.99
	Twenty reis	1.805	916	19 91.9	19 91.99
gal	Gold moidore	0.868	913	9 91.99	9 97.96
ia	Two Union crowns, (assumed)	0.707	900	13 04.19	13 99.97
	Two and half scudi, papal	0.149	900	2 69.87	2 68.93
a	Five rubles	0.215	916	4 97.54	4 97.96
	One hundred lire	0.999	899	19 99.99	19 99.96
	Eight reals	0.773	902.5	14 99.64	14 99.57
ico	Dollar	0.771	900	14 99.73	14 99.46

[1] See report of the Director of the Bureau of the Mint, Philadelphia, date [illegible] of the Secretary of the Treasury for 1867, page 20 et.

Weight, fineness, and value of foreign and domestic coins—Continued.

Country.	GOLD COINS.				
	Denomination.	Weight.	Fineness.	Value.	Value after deduction.
		Oz. dec.	*Thous.*		
Tunis	Twenty-five piastres	0.161	900	$2 99.54	$2 98.05
Turkey	One hundred piastres	0.231	915	4 36.93	4 34.75
Tuscany	Sequin	0.112	999	2 31.29	2 30.14
					Weight in grains.
United States	Dollar, (legal)	0.053.75	900	$1 00	25.8
	Quarter eagle	0.134.37	900	2 50	64.5
	Three dollar	0.161.25	900	3 00	77.4
	Half eagle	0.268.75	900	5 00	129
	Eagle	0.537.05	900	10 00	258
	Double eagle	1.075	900	20 00	516

Country.	SILVER COINS.			
	Denominations.	Weight.	Fineness.	Value.
		Oz. dec.	*Thous.*	
Austria	Old rix dollar	0.902	833	$1 02.27
	Old scudo	0.836	902	1 02.64
	Florin before 1858	0.451	833	51.14
	New florin	0.397	900	48.63
	New Union dollar	0.596	900	73.01
	Maria Theresa dollar, 1780	0.895	838	1 02.12
Belgium	Five francs	0.803	897	98.04
Bolivia	New dollar	0.643	903.5	79.07
	Half dollar	0.432	667	39.22
Brazil	Double milreis	0.820	918.5	1 02.53
Canada	Twenty cents	0.150	925	18.87
Central America	Dollar	0.866	850	1 00.19
Chili	Old dollar	0.864	908	1 06.79
	New dollar	0.801	900.5	98.17
Denmark	Two rigsdaler	0.927	877	1 10.65
England	Shilling, new	0.182.5	924.5	22.96
	Shilling, average	0.178	925	22.41
France	Five franc, average	0.800	900	98.00
Germany, north	Thaler before 1857	0.712	750	72.67
	New thaler	0.595	900	72.89
Germany, south	Florin before 1857	0.340	900	41.65
	New florin, (assumed)	0.340	900	41.65
Greece	Five drachms	0.719	900	88.08
Hindostan	Rupee	0.374	916	46.62
Japan	Itzebu	0.279	991	37.63
	New itzebu	0.279	890	33.80
Mexico	Dollar, new	0.867.5	903	1 06.62
	Dollar, average	0.866	901	1 06.20
	Peso of Maximilian	0.861	902.5	1 05.50

eight, fineness, and value of foreign and domestic coins—Continued.

Country.	Denomination.	Weight.	Fineness.	Value.
	SILVER COINS.			
		Gr. dec.	*Thous.*	
.....	Scudo	0.844	830	$0 95.34
rlands	Two and a half guilder	0.896	944	1 03.31
y	Specie daler	0.927	877	1 10.65
ranada	Dollar of 1857	0.803	896	97.92
.....	Old dollar	0.866	901	1 06.20
	Dollar of 1858	0.766	909	94.77
	Half dollar, 1835–'36	0.423	650	38.31
	Sol	0.892	900	98.24
a.....	Thaler before 1857	0.712	750	72.68
	New thaler	0.285	900	72.89
.....	Scudo	0.864	900	1 05.84
.....	Rouble	0.667	875	79.44
ia.....	Five lire	0.800	900	98.00
.....	New piastrem	0.160	899	20.31
n	Rix dollar	1.092	750	1 11.46
rland	Two francs	0.323	899	39.52
.....	Five piastres	0.511	898.5	62.49
y	Twenty piastres	0.770	830	86.98
uy	Florin	0.220	925	27.60
				Weight in grains.
States.....	Dollar, (legal)	0.859.375	900	412.5
	Half dollar	0.406	900	192
	Quarter dollar	0.200	900	96
	Dime	0.080	900	38.4
	Half dime	0.040	900	19.2
	Three cent	0.024	900	11.52

EXPLANATORY REMARKS.[1]

he first column embraces the names of the countries where the coins ssued; the second contains the names of the coin, only the principal minations being given. The other sizes are proportional; and when is not the case, the deviation is stated.

he third column expresses the weight of a single piece in fractions of troy ounce, carried to the thousandth, and in a few cases to the ten sandth of an ounce. The method is preferable to expressing the ht in grains for commercial purposes, and corresponds better with erms of the mint. It may be readily transferred to weight in grains he following rule:

emove the decimal point; from one-half deduct four per cent. of that and the remainder will be grains.

[1] Appended to the tables by R. H. Lindermann.

The fourth column expresses the fineness in thousandths, *i. e.*, the number of parts of pure gold or silver in 1,000 parts of the coin.

The fifth and sixth columns of the first table express the valuation of gold. In the fifth is shown the value as compared with the legal contents or amount of fine gold in our coin. In the sixth is shown the value as paid at the mint after the uniform deduction of one-half of one per cent. The former is the value for any other purposes than recoinage, and especially for the purpose of comparison; the latter is the value in exchange for our coins at the mint.

For the silver there is no fixed legal valuation, the law providing for shifting the price according to the condition of demand and supply. The present price of standard silver is 122½ cents per ounce, at which rate the values in the fifth column of the second table are calculated. In a few cases, where the coins could not be procured, the data are *assumed* from the legal rates, and so stated.

NOTES ON FOREIGN COINS.

Mr. Linderman adds in his report the following observations on foreign coins:

"The silver *sol* of Peru, which is the successor of the peso or dollar, is found to be of standard fineness, and the average weight 0.802 ounce troy. The dates observed are 1864 to 1866.

"The Mexican silver peso or dollar of Maximilian, of the date 1866, averaged 902½ thousandths fine, and 0.861 ounce, or 413⅜ grains, in weight, upon trial of a considerable quantity. These two reports are furnished by the assay office at New York.

"We have seen but one gold piece of Maximilian, called '20 pesos,' of the date 1866, and weighing 1.086 ounce, or 521¼ grains. We had not the opportunity of assaying it, being held as a curiosity; but the weight indicates that the doubloon fineness of 875 has been retained. On this assumption we place it in the table.

"I will here add the result of a recent assay of single gold pieces of France, of the dates 1863 to 1867, and mint marks of Paris and Strasbourg. This is important in its bearing upon the question of international coinage; for if such an interchange is to take place, the respective countries must keep good faith in regard to the fineness of their coins, otherwise the matter will soon come to an end. We find the fineness varying from 898.5 to 899.8, and averaging 899.2. This has generally been the result for many years, and is not what should be expected. The average ought to be 900, as required by law. The British coins are kept up to the mark."

In the report of the Secretary of the Treasury for 1868, Mr. Linderman says:

"Our silver dollar is not received by the Chinese except at a discount. This is owing to the fact that while it is of equal fineness with the

Spanish or Mexican dollar, it is about one per cent. less in weight. This rejection seems to take away the last plea for continuing to coin this piece.

"We have some interesting details on this subject from the master of the British mint at Hong-Kong, established there a few years since for the purpose of furnishing a silver currency, with the Mexican dollar as its basis.

"The mint has recently been discontinued; but while it lasted its issues were acceptable to the Chinese traders, although the chief part of the coinage found its way to Singapore and the region thereabouts. Fractional parts of the dollar were also struck, both in silver and copper, and it is curious to observe that they followed our centesimal notation, issuing pieces of ten cents, five cents, one cent, and other denominations."

TABLE XI.—WEIGHTS, FINENESS, AND TOLERANCE OF THE PRINCIPAL GOLD COINS.

[Supplied by Thomas Graham, esq., Master of the Royal Mint, in the Report of the Royal Commission on International Coinage, page 227.]

Country.	Coin.	Weight in grains.	Alloy.	Fine gold in grains.	Fine gold in grams.	Tolerance weight.	Fineness.	Mintage, (Frais de Fabrication.)	Loss by wear allowed.
Great Britain	Sovereign	123.274	$\frac{1}{12}$	113.001	7.3225	.00208$\frac{1}{3}$	.002$\frac{29}{48}$	None	Reduced to 122.500 grs.
	Half sovereign	61.637	$\frac{1}{12}$	56.501	3.6612	.00208$\frac{1}{3}$	.002$\frac{29}{48}$	None	Reduced to 61.125 grs.
France, Belgium, Switzerland, and Italy.	25-franc piece	124.452	$\frac{1}{10}$	112.006	7.2581	.002	.002	.00216*	Reduced to 123.581 grs.†
	20 franc	99.56	$\frac{1}{10}$	89.604	5.8064	.002	.002	.00216	
	10 franc	49.78	$\frac{1}{10}$	44.802	2.9032	.002	.002	.00216	
	5 franc	24.89	$\frac{1}{10}$	22.401	1.4516	.003	.002	.00216	
United States of America	Eagle, (10 dollars)	258.00	$\frac{1}{10}$	232.200	15.0466	.00387	.002	.005	
	Half eagle	129.00	$\frac{1}{10}$	116.100	7.5233	.00387	.002	.005	
	Dollar	25.80	$\frac{1}{10}$	23.220	1.5047	.00969	.002	.005	
Prussia	Friedrichs d'or, F. Wm. III, 1831	103.12	$\frac{902.778}{1000}$	93.09	6.0323	.0025	None		
Zollverein	Krone, (crown,) F. Wm. IV, 1859	171.467	$\frac{1}{10}$	154.323	10.000	.0025	.002	.004	.0025
	Half krone of F. Wm. IV, 1858	85.7335	$\frac{1}{10}$	77.160	5.000	.0025	.002	.004	.0025
Austria	Reichsducaten, ducat of Francis Joseph I, 1860.	53.858	$\frac{986.111}{1000}$	53.110	3.441		About .003		
Spain	Doubloon of 10 escudos	129.43	$\frac{1}{10}$	116.48	7.547	.00584	.002	None	.00584
Portugal	Crown of 10,000 reis	273.71	$\frac{1}{12}$	250.90	16.261				
Brazil	Ten mille reis piece	138.35	$\frac{1}{12}$	126.82	8.218				
British India	Gold mohur of 15 rupees	180.00	$\frac{1}{12}$	165.00	10.697				

Denmark	Christian d'or		1000						
Egypt	Fifty piastre piece	66.00	874/1000	57.68	3.738				
Greece	Twenty drachmai piece	89.14	1/10	80.99	5.198	.009	.009		
Holland	Double William	207.68	1/10	186.93	12.112				
	Double ducat	107.84	988/1000	106.01	6.870				
Malta	Doppia, or pistole	197.78		109.12	7.071				
Rome	Ten scudi piece	267.54	1/10	240.78	15.602				
Russia	Half imperial of 5 roubles	100.99	1/2	92.58	6.000	.0051	None	None	.0087
Sweden	Ducat	53.78	975.610/1000	52.47	3.400	.003	.003	.003	
Turkey	Lira of 100 piastres	111.36	1/2	102.01	6.610	.009	.009	.01	

* 6.70 francs on 3,100.

† The loss by wear allowed on the French 20 and 10 francs is 0.7 per cent., inclusive of the tolerance of 0.2 per cent.; on the British sovereign, 0.328 per cent.

TABLE XI.—WEIGHTS, FINENESS, AND TOLERANCE OF THE PRINCIPAL GOLD COINS.

[Supplied by Thomas Graham, esq., Master of the Royal Mint, in the Report of the Royal Commission on International Coinage, page 227.]

Country.	Coin.	Weight in grains.	Alloy.	Fine gold in grains.	Fine gold in grams.	Tolerance weight.	Fineness.	Mintage, (Frais de Fabrication.)	Loss by wear allowed.
Great Britain	Sovereign	123.274	$\frac{1}{12}$	113.001	7.3225	.00208$\frac{1}{3}$	.002$\frac{29}{48}$	None	Reduced to 122.500 grs.
	Half sovereign	61.637	$\frac{1}{12}$	56.501	3.6612	.00208$\frac{1}{3}$	.002$\frac{29}{48}$	None	Reduced to 61.125 grs.
	25-franc piece	124.452	$\frac{1}{10}$	112.006	7.2581	.002	.002	.00216*	Reduced to 123.581 grs.†
France, Belgium, Switzerland, and Italy.	20 franc	99.56	$\frac{1}{10}$	89.604	5.8064	.002	.002	.00216	
	10 franc	49.78	$\frac{1}{10}$	44.802	2.9032	.002	.002	.00216	
	5 franc	24.89	$\frac{1}{10}$	22.401	1.4516	.003	.002	.00216	
United States of America	Eagle, (10 dollars)	258.00	$\frac{1}{10}$	232.200	15.0466	.00387	.002	.005	
	Half eagle	129.00	$\frac{1}{10}$	116.100	7.5233	.00387	.002	.005	
	Dollar	25.80	$\frac{1}{10}$	23.220	1.5047	.00969	.002	.005	
Prussia	Friedrichs d'or, F. Wm. III, 1831	103.12	$\frac{902.778}{1000}$	93.09	6.0323	.0025	None		
Zollverein	Krone, (crown,) F. Wm. IV, 1859	171.467	$\frac{1}{10}$	154.323	10.000	.0025	.002	.004	.0025
	Half krone of F. Wm. IV, 1858	85.7335	$\frac{1}{10}$	77.160	5.000	.0025	.002	.004	.0025
Austria	Reichsducaten, ducat of Francis Joseph I, 1860.	53.858	$\frac{986.111}{1000}$	53.110	3.441		About .003		
Spain	Doubloon of 10 escudos	129.43	$\frac{1}{10}$	116.48	7.547	.00584	.002	None	.00584
Portugal	Crown of 10,000 reis	273.71	$\frac{1}{12}$	250.90	16.261				
Brazil	Ten mille reis piece	138.35	$\frac{1}{12}$	126.82	8.218				
British India	Gold mohur of 15 rupees	180.00	$\frac{1}{12}$	165.00	10.697				

Denmark	Christian d'or		1000						
Egypt	Fifty piastre piece	66.00	$\frac{874}{1000}$	57.68	3.738				
Greece	Twenty drachmai piece	89.14	$\frac{1}{10}$	80.22	5.198	.002	.002		
Holland	Double William	207.68	$\frac{1}{10}$	186.92	12.112				
	Double ducat	107.84	$\frac{983}{1000}$	106.01	6.870				
Malta	Doppia, or pistole	127.78		109.12	7.071				
Rome	Ten scudi piece	267.54	$\frac{1}{10}$	240,78	15.602				
Russia	Half imperial of 5 roubles	100.99	$\frac{1}{12}$	92.58	6.000	.0051	None	None	.0087
Sweden	Ducat	53.78	$\frac{975.610}{1000}$	52.47	3.400	.003	.003	.003	
Turkey	Lira of 100 piastres	111.36	$\frac{1}{12}$	102.01	6.610	.002	.002	.01	

* 6.70 francs on 3,100.

† The loss by wear allowed on the French 20 and 10 francs is 0.7 per cent., inclusive of the tolerance of 0.2 per cent.; on the British sovereign, 0.628 per cent.

TABLE XII.—PRODUCTION OF GOLD.

Table showing approximate production of the principal gold fields of the world, according to Phillips.[1]

	1800.		1850.		1860.		1865.	
	Pounds troy.	Ratio per cent.	Pounds troy.	Ratio per cent.	Pounds troy.	Ratio per cent.	Pounds troy.	Ratio per cent.
Russian empire	1,440	2.7	65 600	19.0	66,000	11.3	69,509	12.4
Austrian empire	3,500	6.5	5,600	1.6	5,500	1.0	5,500	1.0
And rest of Europe			100	.....	350	.....	375	.....
Southern Asia	10,000	18.5	25,000	7.3	25,000	4.3	25,000	4.5
Africa	600	1.2	4,000	1.1	4,000	0.7	4,000	0.7
Chili	7,500	13.8						
Bolivia	1,600	3.0						
Peru	2,400	4.4	34,000	9.9	34,000	5.9	34,000	6.1
New Granada	12,600	23.4						
Brazil	10,000	18.5						
Mexico	4,300	8.0						
California and neighboring States and Territories	.....	.....	208,000	60.2	187,000	31.9	210,000	37.5
Rest of United States	.....	.....	2,950	0.9	1,020	0.2	140	.....
Nova Scotia	.....	.....	.....	.....	.....	.....	2,072	0.4
British Columbia	.....	.....	.....	.....	20,000	3.4	11,600	2.1
Australia	.....	.....	.....	.....	217,500	37.0	156,000	27.9
New Zealand	.....	.....	.....	.....	25,000	4.3	41,400	7.4
Total	53,940	100.00	345,250	100.00	585,370	100.00	559,587	100.00

[1] The Mining and Metallurgy of Gold and Silver, page 127.

[2] The yields of the different members of this group vary considerably from year to year, but the aggregate product is believed to remain tolerably constant.

TABLE XIII.—PRODUCTION OF SILVER.

Table showing the approximate yield of the principal silver-producing countries, according to Phillips.[1]

	1800.		1850.		1865.	
	Pounds troy.	Ratio per cent.	Pounds troy.	Ratio per cent.	Pounds troy.	Ratio per cent.
Russian empire	58,150	2.5	60,000	2.1	58,000	1.5
Scandinavia	141,000	6.0	20,400	0.7	15,000	0.4
Great Britain			48,500	1.7	60,500	1.5
Harts			31,500	1.1	28,000	0.6
Prussia			21,200	0.7	68,000	1.7
Saxony			63,600	2.2	80,000	2.0
Other German states			2,500	0.1	2,500	.....
Austria			87,000	3.1	92,000	2.2
France			5,000	0.2	18,000	0.4
Italy			.....	.....	[2] 25,000	0.6
Spain			125,000	4.4	110,000	2.8
Australia, New Zealand, British Columbia, and Nova Scotia	.....	.....	10,000	0.4	9,500	0.2
Chili	18,300	0.8	238,500	8.4	299,000	7.3
Bolivia	271,300	11.6	130,000	4.6	136,000	3.3
Peru	401,850	17.2	303,150	10.7	299,600	7.4
New Granada	5,000	0.2	13,000	0.5	15,000	0.4
Brazil	1,200	.....	675	.....	1,500	0.4
Mexico	1,440,500	61.7	1,650,000	58.4	1,700,000	42.3
United States	.....	.....	17,400	0.7	1,000,000	25.0
Total	2,337,300	100.00	2,827,425	100.00	4,017,000	100.00

[1] The Mining and Metallurgy of Gold and Silver, page 320.

[2] Obtained from the island of Sardinia, where it is found associated with galena.

TABLE XIV.—PRODUCTION OF THE PRECIOUS METALS, ACCORDING TO BIRKMYRE—1846 and 1850.

Comparative table showing the annual produce (approximate calculation) in value of fine gold and silver for 1846 *and* 1850, *the first being two years before the discovery of the rich deposits of gold in California, the latter two years after the discovery.*

Countries.	1846.			1850.		
	Gold.	Silver.	Total.	Gold.	Silver.	Total.
California	.....	.....	.....	£12,000,000	£62, 088	£12, 062, 088
United States	£237, 336	£1, 864	£239, 230	115, 430	11, 444	126, 874
Mexico	249, 753	3, 457, 020	3, 706, 773	382, 901	5, 383, 333	5, 766, 234
New Granada	252, 407	42, 929	295, 336	252, 407	42, 929	295, 336
Peru	96, 241	1, 000, 583	1, 096, 824	96, 241	1, 000, 583	1, 096, 824
Bolivia	60, 337	460, 191	520, 548	60, 357	460, 191	520, 548
Chili	145, 585	297, 029	442, 614	145, 585	297, 029	442, 614
Brazil	259, 871	2, 003	261, 874	289, 068	2, 227	291, 295
Total of N. and S. America	1, 301, 560	5, 261, 619	6, 563, 179	13, 341, 989	7, 259, 824	20, 601, 813
Russia	3, 414, 427	167, 831	3, 582, 258	4, 175, 860	171, 817	4, 347, 477
Norway	.....	32, 346	32, 346	.....	35, 607	35, 607
North Germany	357	138, 022	138, 379	357	138, 022	138, 379
Saxony	.....	198, 200	198, 200	.....	198, 200	198, 200
Austria	282, 750	282, 654	565, 404	288, 708	286, 971	575, 679
Piedmont	17, 841	7, 444	25, 285	17, 841	7, 444	25, 285
Spain	2, 498	227, 499	229, 997	2, 498	440, 210	442, 708
United Kingdom	.....	109, 989	109, 989	.....	160, 000	160, 000
Africa	203, 900	1, 056	204, 956	203, 900	1, 056	204, 956
Borneo	305, 900	1, 584	307, 484	305, 850	1, 584	307, 484
Ava	100, 000	517	100, 517	100, 000	517	100, 517
Malacca	72, 240	374	72, 614	72, 240	374	72, 614
Sumatra	63, 719	330	64, 049	63, 719	330	64, 049
Annam or Tonquin	30, 585	53, 460	84, 045	30, 585	53, 460	84, 045
Various countries [1]	50, 975	33, 000	83, 975	50, 975	33, 000	83, 975
Total of Europe, Africa, and Asia	4, 545, 192	1, 254, 306	5, 799, 498	5, 312, 533	1, 528, 592	6, 840, 975
Total of North and South America	1, 301, 560	5, 261, 619	6, 563, 179	13, 341, 989	7, 259, 824	20, 601, 813
Total	5, 846, 752	6, 515, 925	12, 362, 677	18, 654, 522	8, 788, 416	27, 442, 788

[1] Exclusive of China and Japan, which produce large quantities of gold and silver, the amount of which is quite unknown to Europeans.

APPENDIX E.

METRICAL AND OTHER WEIGHTS AND THEIR EQUIVALENTS.

For the convenience of those who consult this report, the metric system of weights, with the equivalents of its denominations in troy and avoirdupois weights, are given below, together with equivalents and values of some other systems of weights and values.

In the foregoing pages, for the conversion of figures given in pounds (£) sterling into dollars, when exact figures were not essential, as in the case of estimates and round numbers, $5 has been taken as the equivalent of the £; and when sums expressed in francs have been converted into dollars, 5 francs has been taken as the equivalent of the dollar. In calculating the value of amounts of silver expressed in troy ounces, the ounce has been reckoned as worth $1.25. For native gold the value per ounce has been reckoned as at from $16 to $20, according to the source of production. In the statistics of total of gold and silver in the United States, when tons are mentioned, a net or "short" ton of 2,000 pounds avoirdupois is intended, unless it is otherwise stated.

Table of metric weights and their equivalents in avoirdupois and troy weights.

Metric system of weights.		Equivalents in—	
Name.	No. of grams.	Avoirdupois weight.	Troy weight.
Millier or tonneau	1000000	2204.6 pounds	1152 ounces
Quintal	100000	220.46 pounds	32.15 ounces
Myriagram	10000	22.046 pounds	321.5 ounces.
Kilogram or kilo	1000	2.2046 pounds	32.15 ounces.
Hectogram	100	3.527 ounces	3.215 ounces.
Decagram	10	.3527 ounce	0.32 ounces.
Gram	1	15.43 grains	15.432 grains.
Decigram	.1	1.543 grains	1.543 grains.
Centigram	.01	.154 grain	0.154 grain.
Milligram	.001	0.015 grain	0.015 grain.

Denominations of weights of various countries and their equivalents in the metric and other systems.

	Equivalent in the metric system.	Equivalent in avoirdupois weight.	Equivalent in troy weight.
Avoirdupois pound (lb.)	453. 60 grams	1 pound	1. 2153 pound.
Troy pound (lb.)	373. 24 grams	. 8228 pound	1 pound.
Troy ounce (oz.)	31. 10 grams		1-12 pound.
Livre (France)	. 41 kilog	0. 90389 pound	
Livre (Russia)	. 41 kilog	0. 90389 pound	
Pood (Russia)	16. 380 kilog	36. 117 pounds	
Zolotnik (Russia)	4. 266 grams		65. 833 grains.
Mark (Norway and Sweden)	210. 72 grams		3252 grains.
Oitava (Brazil)	3. 584 grams		55. 343 grains.
Centner (Vienna)	56. 902 kilog	125. 442 pounds	

ERRATA.

Page 177, last line, for "2,375," read 2.375.
Page 182, in the table, for "176,782," read 17,678.2.
Page 184, last line, for "3.252 grams," read 3252 grains.
Page 301, lines 13 and 15, for "grains," read grams.
Page 322, line 27, for "Nearly" read Near.

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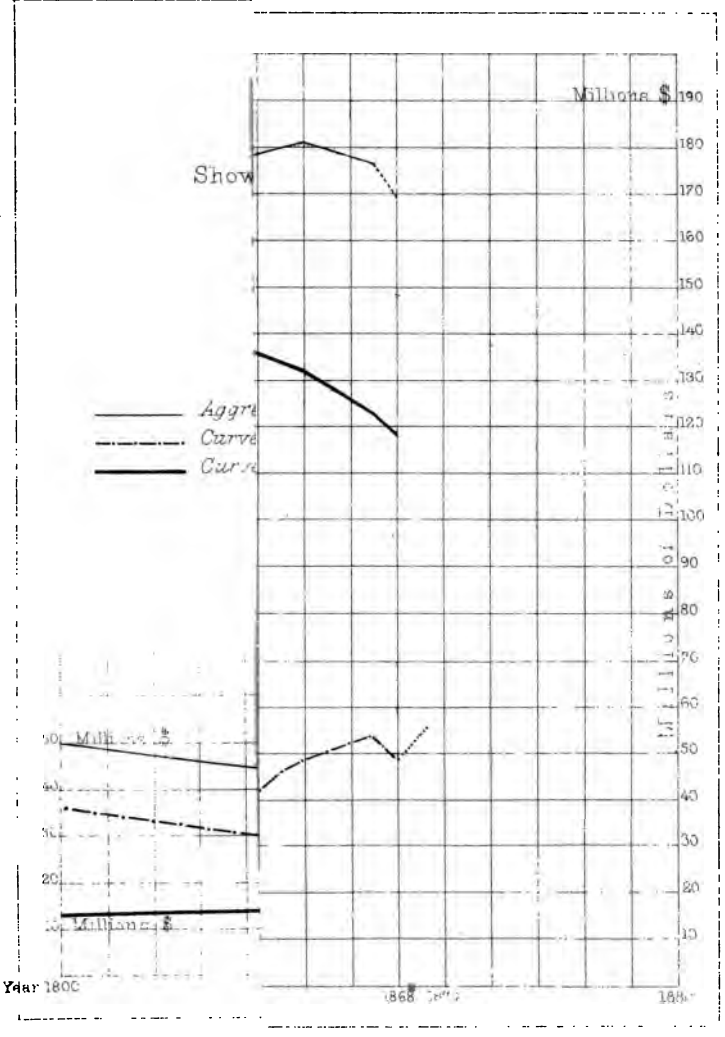
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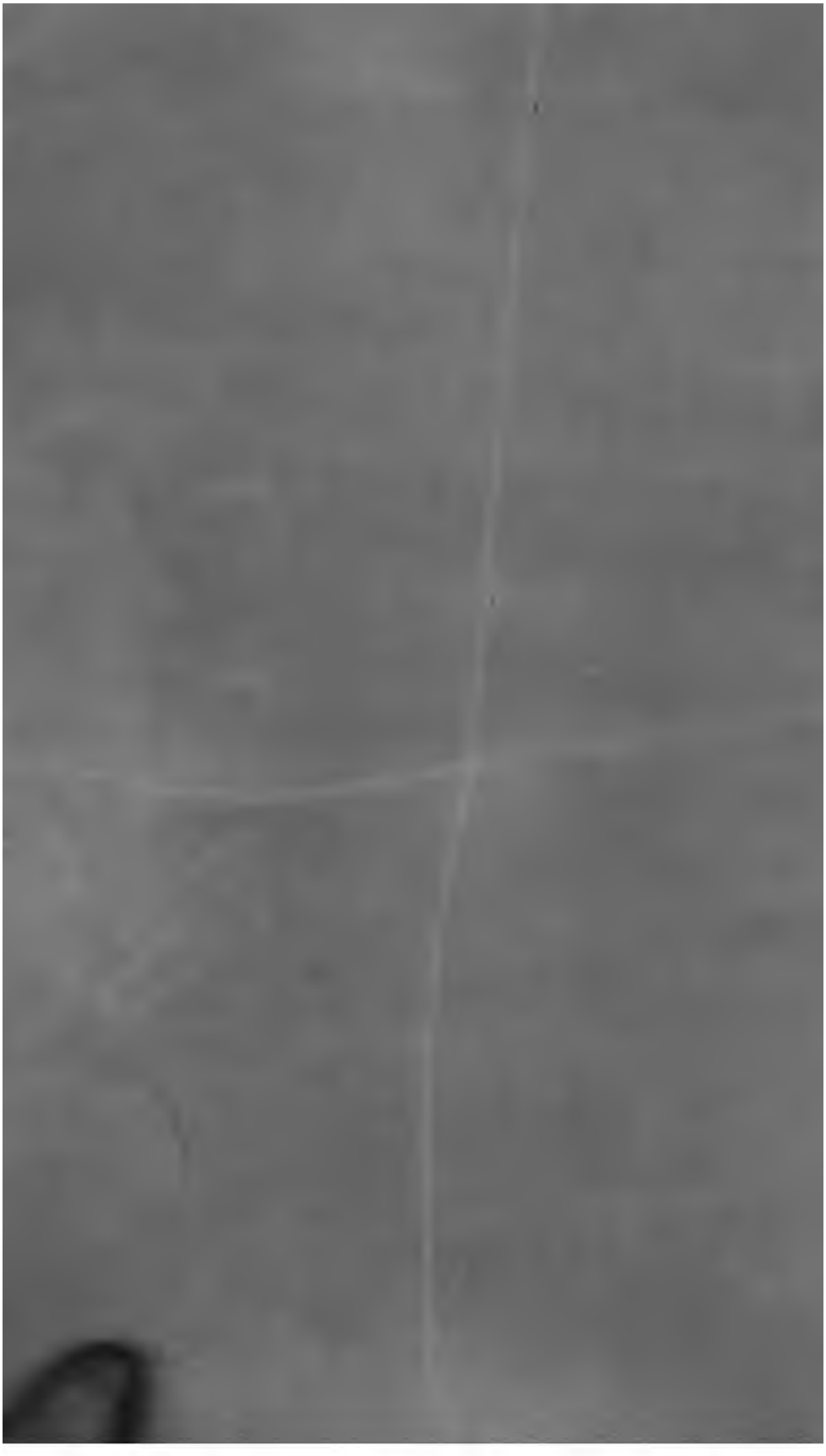

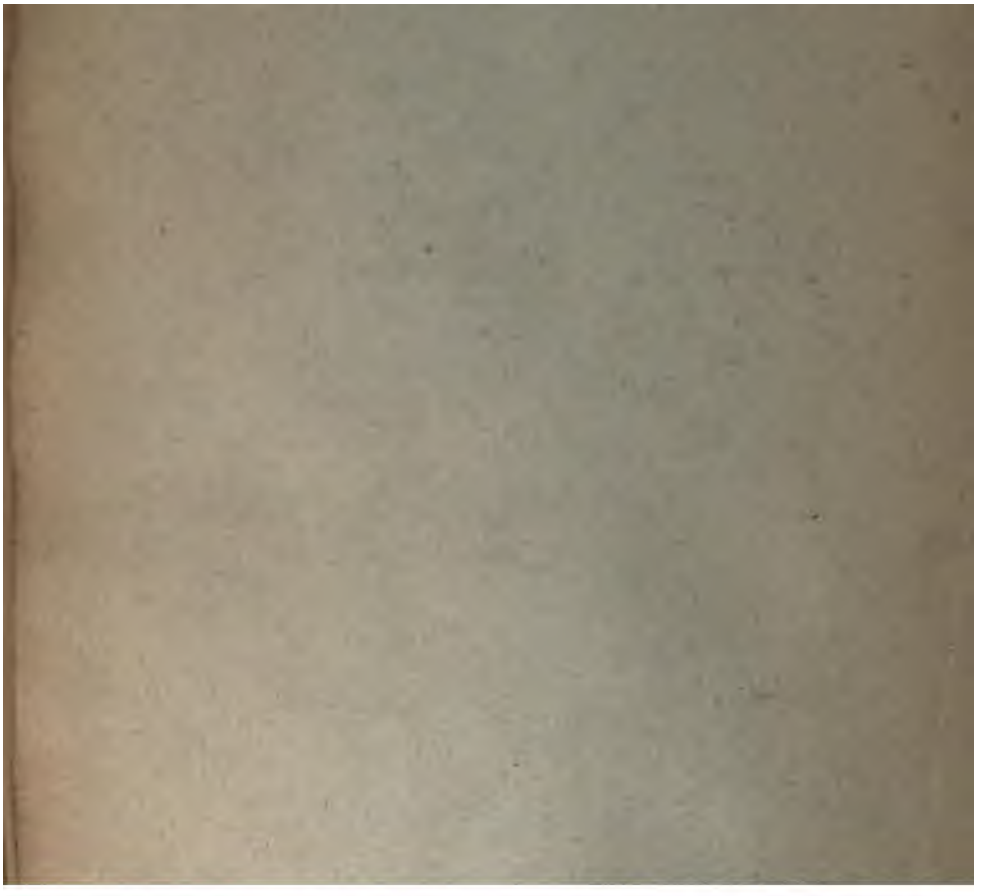

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